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ON THE EFFECTS OF ARTS, TRADES, AND PROFESSIONS, AS WELL AS HABITS OF LIVING, ON HEALTH AND LONGEVITY.

No. XII.

Copper.—This metal is oftener productive of disease from its employment in culinary and other domestic operations than from its other uses in the arts. Patissier states that the workmen in copper become prematurely old, having a meagre and sickly appearance. This, however, may be owing more to confinement in ill-ventilated places and to intemperate habits than to the metal itself. There are sufficient facts on record to prove that exposure to its influence may cause *colica pictonum*, and that those engaged in filing the metal are subject especially to diseases of the respiratory organs. This effect is doubtless caused by the mechanical irritation of the particles floating in the atmosphere, and brought by inhalation in contact with the delicate lining tissue of the air-passages. Thus we find that asthma and cough are frequent diseases among brassfounders, which may partly be due to the vaporization of a portion of the zinc with which copper is amalgamated. Fine scales are also given off from the imperfectly volatilized metal, and by the fumes of the *spelter* or solder of brass, which are productive of injurious effects. In Birmingham and Leeds, Thackrah states

that the brassfounders are generally very short lived; but that, as a class, they are extremely intemperate.

A few years since, copper was extensively used in this city by confectioners and others, to impart color to sweetmeats and preserves, pickles, &c. In consequence of this practice, there can be no doubt that the health of many persons was seriously injured, although the cause was for the most part concealed. Such accidents are now, it is believed, comparatively rare, in consequence either of tinning copper vessels, or substituting cooking utensils of zinc or iron in their place. It is yet, however, quite a common practice to prepare pickles in copper vessels, in order to give them a beautiful green color; thus producing *verdigris*, the most deleterious of all the preparations of this metal.

It has been stated by some writers, that with careful management, copper vessels may be safely employed in the preparation of food, and Michaelis has been quoted to this effect, who tells us that in the orphan asylum of Hull, the food was in his time prepared in large copper vessels, which were kept remarkably clean, and that out of a population of 800 or 900, he never heard of any one having suffered from symptoms of poisoning with copper. In this case, the quantity of the metal was probably too small to produce any violent symptoms, although it may have exercised a slow and deleterious influence upon the health. Copper, when exposed to water or to a damp atmosphere, becomes readily oxidated or changed into a green carbonate, in which state it is readily dissolved by mineral and vegetable acids, especially when aided by heat. *Fat* bodies also act with celerity on copper; and Sir Humphrey Davy has shown that weak solutions of *salt* act strongly on this metal. Copper stills are in very common use in this country, although they are prohibited by law in several countries of Europe, unless they are tinned. Copper is often employed for cocks in vessels containing wine, cider, and beer, and there are many cases of poisoning on record, which have been traced to this cause. A few days since the newspapers contained an account of the poisoning of several negroes at the south, in consequence of their drinking water in which a copper tube was placed. Orfila gives an

instance of a family of nine persons who were poisoned from eating food cooked in copper vessels. From the same cause, the Jacobin friars in Paris, to the number of 21, were poisoned in 1781. Dupuytren mentions a case where a family was poisoned from eating lobsters which had been cooked and afterwards placed in a copper vessel, which was covered with verdigris. The Boston Medical and Surgical Journal, vol. ii, p. 305, contains an account of the poisoning of a whole family by milk which had stood in a copper pan: on analysis, Dr. Jackson found it to contain sub-acetate of copper. Christison, however, thinks it an erroneous idea that milk, heated or allowed to stand in a copper vessel, becomes impregnated with the metal. The books are full of cases of poisoning from the use of wines and vinegar kept in copper, or in which copper stopcocks were inserted. From the experiments of Proust, there is reason to believe that the action of the vegetable acids, and more particularly of vinegar on copper, depends on the coöperation of the atmospheric air held in solution by the fluid and in contact with its surface. Hence we account for the fact, that while it may not be dangerous to boil acidulous liquids in copper vessels, it may yet be very unsafe to keep these fluids cold in the same vessels. Where copper vessels are tinned, the tinning is apt to be worn away, leaving the copper exposed; but as this metal has been almost superseded by the introduction of cheaper cast-iron articles for culinary operations, there is but little danger to be apprehended from its employment for such purposes. These remarks, however, belong rather to the department of Hygiene than to the subjects which we have undertaken to discuss.

Zinc.—This metal, though far less deleterious than mercury, lead, or copper, is still productive of some deleterious effects. In the founding of *yellow* brass, the evolution of oxide of zinc affects the respiration, and to some extent the digestive organs, causing difficulty of breathing, cough, pain at the stomach, and occasionally vomiting. In Birmingham, Thackrah states that the brass-melters are subject to intermittent fever, which is termed the brass ague, which attacks the workmen from once a month to once a year, and leaves them in a state of great de-

bility. Among brass-filers, the hair of the head is sometimes changed to green, from coppery particles combining with the oil of the hair. Gilt button makers suffer more or less from the fumes of zinc in *casting*, which cause giddiness, headache, sickness, loss of appetite, and bilious disorders. In Rust's Magazine, (vol. xxi, p. 563) there is a report of a case where an apothecary suffered severely from filling his laboratory with the fumes of zinc. The same day he was seized with tightness in the chest, headache, and giddiness; next morning, with violent cough, vomiting, and stiffness of the limbs; on the third day, with a coppery taste in the mouth, some salivation, gripes, and such an increase of giddiness that he could not stand.

From a report of a committee of the French Institute, appointed to inquire into the propriety of employing zinc for the fabrication of measures for liquids, and for culinary vessels and utensils for the use of military hospitals, it appears that though the oxide itself may not be dangerous, yet if zinc vessels be used for domestic purposes, we shall have a variety of deleterious salts produced from the numerous ingredients employed for food. The metal is therefore condemned as highly dangerous for such uses. Where zinc vessels are tinned on the inner surface, an acrid and disagreeable flavor is imparted to the food, probably from galvanic action. For these reasons, and from the fact that the metal is extremely brittle, it will probably never come into very general use.

Chrome.—This metal has lately been employed to a considerable extent in the arts, particularly in dyeing. In Glasgow, it was observed upon its first introduction for this purpose, that the workmen who had their hands often immersed in the bichromate of potash were affected with troublesome sores in the parts touched by it; and these gradually extended deeper and deeper, without spreading, till they in some cases made their way through the hand or arm altogether. Dr. Baer, of Baltimore, where this salt is largely manufactured, has frequently observed the same effects. The first effect of its habitual application to the skin is a papulous eruption, which in a short time becomes pustulous. If the exposure continue, deep sloughs form under the pustules. To prevent these effects, an apparatus

was constructed so as to require only the immersion of the tips of the fingers; but even then the eruption made its appearance in susceptible individuals. Dr. Baer states that he has seen these ulcers on parts of the body where the solution did not come in contact, and he therefore thinks them owing to the effects of vapors charged with chromic acid. He however observed no effects on the skin from the most concentrated form of the solution, when the cuticle was not abraded.

Arsenic.—The *white oxide of arsenic*, or, according to chemical nomenclature, *arsenious acid*, (from the fact that it possesses some of the properties of an acid) is commonly obtained by roasting *cobalt* ores, which always contain a portion of this mineral. The vapors are condensed in a large chamber, and potash added to them; the mixture is then sublimed, and the white oxide obtained, leaving potash with sulphur. This process is extremely dangerous, and in a short time a fatal one; and accordingly convicts, whose punishment would otherwise be death, are condemned to it. The deleterious nature of arsenical fumes have been known from a very remote period; and Beckman states that a prayer was formerly offered up in the German church, that "God would preserve miners from *cobalt and spirits*"*!* (vol. ii, p. 263.)

The copper ores in Cornwall and Wales (Eng.) are known to contain a considerable quantity of arsenic; and Dr. Paris states that in the vicinity of the smelting works, horses and cows commonly lose their hoofs, and the latter are often seen in the neighboring pastures crawling on their knees, and not unfrequently suffering from a cancerous affection in their rumps, whilst the milch cows in addition are soon deprived of their milk. The men employed about the works are in the habit of guarding themselves against the effects of the arsenical vapor by taking large quantities of *sweet oil*, to purchase which a sum of money is annually allowed by the proprietors. The smelters are also subject to a cancerous affection of the scrotum, similar to that which infests chimney sweepers.

In chemical manipulations, injurious effects are sometimes experienced, unless great care be exercised. Van Swieten states, that while Tachenius was endeavoring to fix the arsenic

by repeated sublimations, he inspired a very sweet air; but in the course of half an hour he breathed with difficulty, suffered convulsions in all parts of his body, and passed bloody urine with great pain. Dr. Gordon tells us, that while he was sublimating arsenic the vessel broke, and on removing it from the fire he inhaled a small quantity, when immediately he felt a sense of pain and tightness about the præcordia, with a difficulty of breathing and violent cough. The pulse became weaker and quicker than natural, and on the next day all the symptoms were gone except the cough and nausea. Gehlen, professor in the Academy of Munich, while examining the reciprocal actions of arsenic and potass, incautiously attempted to judge by smell, was poisoned by the gas, and thus fell a victim to his imprudence after an illness of nine days. Arseniuretted hydrogen is now rarely prepared, on account of the danger attending the process. Arsenite of copper (Scheele's green, mineral green) is a preparation of arsenic, well known as a pigment, and has been used as a poison, and has been detected in sweetmeats, in the preparation of which it was employed to impart a green color; it is a compound of arsenious acid and deutoxide of copper, and is sold in powder or pulverulent cakes, and has a fine grass-green color, although the mineral green of the shops is sometimes a mixture of the hydrated oxide of copper and carbonate of lime. *King's yellow* is another arsenical preparation, composed of the sulphuret, caustic lime, and free sulphur. *Orpiment* and *realgar*, which are native sulphurets of arsenic, are less actively poisonous than artificial orpiment, which is a compound of sulphuret of arsenic and arsenious acids. In the preparation of these paints, great care is necessary lest the arsenical fumes be inhaled. A case was reported to the French Academy of Medicine, a few years since, (Med. Chir. Rev. vol. xxiii, p. 509) where a manufacturer of the blue pigment, used in painting china, was engaged with his servant in boiling a mixture of nitric acid, cobalt and arsenic, on a sudden the mattrass burst, and the room was filled with the fumes. The servant escaped, but the master was knocked down and lay insensible for some time. He died after eight days intense suffering, his body having become enormously swollen. The

servant was attacked with similar swelling of the abdomen, but was relieved by purgatives and the warm bath.

Another case is related by Dr. Elliotson, where a family were seized with nausea and vomiting, and had watery eyes: their pulses were rapid, and there was an inflammatory state of the system in all. As none of the neighbors were similarly affected, he suspected that arsenic might have occasioned the symptoms, and on inquiry he found that the persons who had previously occupied the premises were mixers of colors, and had deposited before leaving, in the kitchen and garden, large quantities of arsenite of copper. The situation of the house was damp, and it was the opinion of a chemist that the contact of water decomposed the arsenite, and produced arseniuretted hydrogen. It is very possible that this gas, on inspiration, is decomposed in the lungs, the hydrogen uniting with the carbonic acid, while the arsenic is deposited in the bronchiæ.

The *black oxide of arsenic*—the protoxide of Berzelius—is extensively employed as a poison to destroy insects and other animals in France and Germany, under the name of *fly powder*, and has been of late introduced for the same purpose into our own country. It is simply a mixture of metallic arsenic and its white oxide, and is only noticed here, as it may occasionally give rise to accidental poisoning.

Antimony.—This is chiefly employed in medicine under the form of tartar-emetic, although it is used to a considerable extent as an alloy with other metals to form printers' types, pewter, white, queen's and britannia metal, &c. It is seldom productive of injurious effects, although Fourcroy relates that he has seen 50 persons who were seized with a great difficulty of breathing, tightness of the chest and a dry cough, gripings and purging, ten or twelve hours after having respired the vapors of sulphuret of antimony, which had been detonated with nitre. This metal, as well as zinc and arsenic, is seldom productive of hurtful effects amongst artisans, owing probably to the fact that it is used in but small quantities, as is the case with the latter, while zinc only proves deleterious when oxidized.

The other metals—such as *tin*, *silver*, *iodine*, *titanium*, *gold*, *cobalt*, *bismuth*, &c.—rarely give occasion to any injurious effects

to those engaged in working them, arising from any specific poisonous properties which they possess, either simply or given off when entering into a state of combination. The effects produced by their molecules acting mechanically will form a topic of remark hereafter.

Accidents have frequently occurred to chemists from the manufacture of detonating mixtures; and it is but a few years since Mr. Cohen, of this city, was blown to atoms from the explosion of a large quantity of fulminating mercury. These accidents might in general be avoided, were it recollected that fulminating silver and mercury bear the heat of 212, and according to Turner of 260°, without detonating, but that a higher temperature, or even slight percussion or friction, causes them to explode.*

MINERAL GASES.—The acrid vapors which proceed from the mineral acids often produce violent effects when respired, chiefly asphyxia and severe inflammation of the air-passages. The poisonous gases may be divided into two classes, the *irritant* and the *narcotic;* the former embracing *nitric oxide gas* and *nitrous acid vapor*, *muriatic acid gas*, *chlorine*, *ammonia*, *sulphurous acid*, *&c.;* the latter, *sulphuretted hydrogen*, *carburetted hydrogen*, *carbonic acid*, *carbonic oxide*, *nitrous oxide*, *cyanogen*, and *oxygen*.

The *nitric oxide gas* and *nitrous acid vapor* are probably the most deleterious in their effects of all the poisonous gases. According to Nysten, a very small quantity causes death by tetanus, when introduced into a vein, the cavity of the chest, or the cellular tissue; and it always changes the state of the blood, giving it a chocolate brown color, and preventing its coagulation. This gas is changed immediately into nitrous acid vapor, by its

* Most of the deflagrating substances are compounds of the chlorates, which are decomposed by a red heat, and converted into metallic chlorides, with evolution of pure oxygen gas. They deflagrate with inflammable substances with greater violence than nitrates, yielding oxygen with such facility that an explosion is produced by slight causes. Thus, a mixture of sulphur with three times its weight of chlorate of potassa, explodes when struck between two hard surfaces. With charcoal and the sulphurets of arsenic and antimony, this salt forms similar explosive mixtures; and with phosphorus it detonates violently by percussion. One of the mixtures employed in the percussion locks for guns consists of sulphur and chlorate of potassa, with which a little charcoal or gunpowder is mixed; but as the use of these materials is found corrosive to the lock, fulminating mercury is now generally preferred.

combining with the oxygen of the air, and is therefore inhaled into the lungs in this form. When Sir Humphrey Davy attempted to breathe it, having first inhaled the nitrous oxide or intoxicating gas in order to expel the atmospheric air from the lungs, he found that it immediately produced a sense of burning in the throat, which stimulated the glottis to contract, so that none of the nitric oxide gas could pass into the lungs. The subsequent introduction of external air into the mouth changed the gas into nitrous acid vapor, by which the tongue, cheek and gums were irritated and inflamed; and had the same been received into the lungs, the result would in all probability have proved fatal, from the inflammation which it would have excited. An instance is related in Corvisart's Journal of Medicine, (vol. viii, p. 487) where a chemical manufacturer, in endeavoring to remove from his store-room a hamper in which some bottles of nitrous acid had burst, breathed the fumes for some time, and was seized in four hours with symptoms of inflammation in the throat and stomach; at night the urine was suppressed; the skin afterwards became blue: at last he was seized with hiccup, acute pain in the diaphragm, convulsions and delirium, and he died 27 hours after the accident. Another similar case is related in the Bulletin of the Medical Society of Emulation, (Oct. 1823) which proved fatal in two days, with symptoms of violent pneumonia. In Hencke's Journal, two cases are related of death from the same cause in hatters. They had incautiously exposed themselves too much to the fumes which are disengaged during the preparation of nitrate for the fitting of the furs. Two men died of inflammation of the lungs excited in that manner; and a third, a boy of 14, after sleeping all night in an apartment where the mixture was effervescing, was attacked in the morning with yellowness of the skin, giddiness, and colic, which ended fatally in six days. There are various processes in the arts in which nitric acid or aqua fortis is used, and where serious accidents might arise from the want of proper precautions; a knowledge of the above facts may serve to point out the cause and extent of danger in the employment of this article.

Chlorine.—This gas is now extensively employed in the arts, for purposes of bleaching cloths, wax, and various other articles.

When first breathed it always produces more or less irritation of the lungs; and when inhaled in larger quantities it excites violent inflammation of the same organ. Christison quotes a case from Wilmer, where a young man, after breathing diluted chlorine as an experiment, was instantly seized with violent irritation in the epiglottis, windpipe, and bronchial tubes—cough, tightness, and sense of pressure in the chest, inability to swallow, great difficulty in breathing or articulating, discharge of mucus from the mouth and nostrils, severe sneezing, swelling of the face, and protrusion of the eyes. He was relieved by the inhalation of a little sulphuretted hydrogen, so that in an hour and a half he was tolerably well.

Although chlorine is extremely irritating to the lungs of those who are not in the habit of breathing it, yet custom in a short time seems to render it almost if not entirely innoxious. In a wax-bleaching establishment in this city, which is constantly filled with this gas, the workmen informed me that though they suffered a good deal of inconvenience at first, yet that they had now become so accustomed to breathing it that it did not trouble them. This is also the experience of those employed in the large chemical establishments in Europe; and Dr. Christison informs us that a proprietor in Belfast stated to him that his workmen could work with impunity in an atmosphere of chlorine, where he himself could not remain above a few minutes. The chief consequences of exposure to this gas are acidity and other stomach complaints, which the men correct by taking chalk. Exposure to this gas is said to prevent corpulency, and to remove it in those where it already exists. It is an interesting fact that during the epidemic fever which raged over Ireland from 1816 to 1819, the people of the manufactories at Belfast, where chlorine was inhaled, were exempt from it. On the whole, facts do not warrant us in believing that this gas, when habitually inhaled, is seriously detrimental to health. The other irritant gases are seldom productive of injurious effects to artisans, on account of the rare exposure to them.

Sulphuretted Hydrogen.—This is probably the most deleterious of all the narcotic gases. According to Thenard and Dupuytren, air impregnated with $\frac{1}{1500}$ part of the gas, kills birds in a short

space of time; and with about twice that proportion, or $\frac{1}{800}$, it will soon kill a dog. It is also very injurious to vegetables, as Dr. Turner found that $4\frac{1}{2}$ cubic inches of it, diluted with 80 volumes of atmospheric air, caused plants to droop, and in a short time to die. As the exhalations from sinks and privies are chiefly ammonia and sulphuretted hydrogen, there can be no doubt that the presence of this gas in such large quantities in the atmosphere, derived from these sources, is one of the principal causes of the insalubrity of large cities, particularly to young children.

The symptoms produced by breathing these vapors in a state of concentration, are, sudden weakness and all the signs of ordinary asphyxia; the individual becomes suddenly weak and insensible, falls down, and either expires immediately, or, if quickly extricated, he may shortly revive, and eventually recover after considerable suffering. If the noxious emanations are less concentrated, exposure to them may either produce stupor, or stupor in connection with tetanic convulsions. In the comatose form, according to Christison, the workman seems to fall gently asleep while at work, is roused with difficulty, and has no recollection afterwards of what passed before the accident. The convulsive form is sometimes preceded by noisy and restless delirium, sometimes by sudden faintness, heaving or pain in the stomach, and pains in the arms, and almost always by difficult breathing, from weakness in the muscles of the chest. Insensibility and a state resembling asphyxia rapidly succeed, during which the pupil is fixed and dilated, the mouth filled with white or bloody froth, the skin cold, and the pulse feeble and irregular. At last, convulsive efforts to breathe ensue: these are followed by general tetanic spasms of the trunk and extremities; and if the case is to prove fatal, which it may not do for two hours, a state of calm and total insensibility precedes death for a short interval. When the exposure has been too slight to cause serious mischief, the individual is affected with sickness, colic, imperfectly defined pains in the chest, and lethargy.

These effects are not often witnessed in this country, though they are not unfrequent in France, where the pipe of the privy

terminates under ground, in a pit which is usually contained in a small covered vault. We have, however, known analogous accidents occur in this city from clearing out of drains. As there are but few chemical manipulations where sulphuretted hydrogen is evolved, it is unnecessary to point them out more particularly. We may always detect the presence of this gas by exposing to it a bit of filtering paper moistened with a solution of lead. As lights burn with brilliancy in it, even when sufficiently concentrated to destroy animal life, the burning of a taper cannot be considered as a correct test of the purity of the air.

Carburetted Hydrogen.—The varieties of this gas are all more or less narcotic, though inferior in energy to sulphuretted hydrogen. That it is deleterious to health, is obvious from the experiments of Sir Humphrey Davy, who was attacked with giddiness, headache, and weakness of the limbs, from breathing a mixture of three parts of it and two of air, produced by the decomposition of water by red-hot charcoal. When he breathed it pure, the first inspiration caused a sense of numbness in the muscles of the chest; the second caused an overpowering sense of oppression in the breast, and insensibility to external objects; during the third, he seemed sinking into annihilation, and the mouth-piece dropped out of his hand. On becoming again sensible, which happened in less than a minute, he continued for some time to suffer from a feeling of impending suffocation, extreme exhaustion, and great feebleness of the pulse: throughout the rest of the day he was affected with weakness, giddiness and headache.

Those engaged in the manufacture of this gas from coal, oil, or pitch, do not appear to suffer materially from breathing it, in consequence doubtless of its dilution with atmospheric air; and Dr. Christison states, that while engaged with the late Dr. Turner in experimenting with its different varieties, they never perceived anything unpleasant from it, although they breathed an air for several days strongly impregnated with it. Such is the experience of gas-men generally as to its effects. In the Annals of Hygiene, (vol. iii, p. 457) an instance is related where, in consequence of a leak in the service pipe which supplied a

warehouse, five individuals who slept in the house were attacked during the night with stupor, and if one of them had not been awakened by the smell, and alarmed the rest, it is probable that all would have perished. As it was, one man was found completely comatose, and occasionally convulsed, with froth issuing from the mouth, occasional vomiting, stertorous respiration, and dilated pupils. Some temporary amendment was procured by bloodletting; but the breathing continued laborious, and he expired about nine hours after the party went to bed, and six hours after the alarm was given. This case shows the importance of guarding carefully against the leaking of gas fixtures, in houses lighted in this manner. The result of researches on this subject shows, that while carburetted hydrogen is highly detrimental to health when breathed in a concentrated form, yet that when moderately diluted with atmospheric air, it loses its deleterious properties.

For the American Repertory.

LYCEUM OF NATURAL HISTORY.

PROCEEDINGS.

September. Dr. Draper exhibited a number of daguerreotype views, showing the advantage of taking magnified impressions of various parts of insects, blood, and other minute objects by the daguerreotype.

Mr. Warden, of Paris, presented the "Annales de Horticulture," of Paris. Mr. Wheatley presented specimens of Pandora trilineata, Ranella caudata, Petricola pholadaformis, a curious lusus of Mactra gigantea from Staten Island, also a fossil shell from the same place. Mr. W. C. Redfield presented a fossil Ostrea from Claiborne, Alab. Mr. Taber presented a curious apparatus for weighing coins, made A. D. 1688. Mr. Cozzens presented specimens of clay from various localities: referred to Dr. Draper for examination and report. Dr. Jacob Porter presented a number of pamphlets; also, collection of cryptogamous plants, insects, and minerals from the vicinity of Plainfield, Mass. Thanks of the society were voted to Dr. P., and the secretary was directed to furnish such numbers of the an-

nals as he required to complete his set. Dr. Feuchtwanger presented a mollusca taken in the Hudson river: referred to Dr. De Kay for examination and report. Mr. Zabriskie presented a number of fossil shells from White Lake, Sussex co. N. J., where they are found in great quantities, being thrown up by springs which rise from the sides and bottom of the lake. Dr. Budd presented similar shells from a lake in Warren co. N. J.; also, a specimen of sipunculus verrucosus from Bermuda. He exhibited beautiful specimens of Hyalea cuspidata. Dr. Jay presented a drawing of a new species of Cypræa from Zanzibar, where it was obtained by Mr. Waters, and valued by him at $200. Dr. J. intends giving a description of the shell at some future meeting. Dr. Smith presented a work on the nervous system.

The Transactions of the American Phil. Soc. vol. vii, part 1, was received from the Society. Audubon's Birds of America, No. 17; London and Edinburgh Phil. Mag. No. 109, and the American Repertory, vol. ii, No. 2, were received.

October. Dr. Draper made a verbal report on the varieties of clay referred to him last month. Mr. W. C. Redfield mentioned a new locality of fossil fish at Durham, Ct. and exhibited specimens from that place. He also exhibited specimens from the sandstone formation of New-Jersey, near Booneton, belonging to the genera Paleoniscus and Catopterus, and pointed out the identity of the species with those found at the several localities in the sandstone formation of Connecticut and Massachusetts. These species have heteroceral tails, showing according to Agassiz, that their place is in the lower rocks of the new red sandstone series, if not in a still lower geological position. The species most abundant in each formation is the Catopterus gracilis, described by Mr. John H. Redfield in the Annals of the Lyceum. Mr. R. also stated that the lithological appearances of the shales in which these fish are found, as well as the more minute fossils which accompany them, are nearly the same in both formations. Slight contortions of the strata, and small faults or dislocations often affecting the specimens, are also common to all the localities, and seem referable to the forces of ancient earthquakes. He also submitted specimens

of fossil fish from the coal basin of Chesterfield county, Virginia, being a new species of the genus Catopterus. This species, which is from four to five inches in length, is remarkable for its fine spreading caudal and anal fins, and for the numerous fine raylets with which the anterior margins of the fins are surmounted. The position of these fishes was about 150 feet above the principal coal bed. Mr. W. C. Redfield exhibited a number of specimens of fossil footmarks, apparently of birds, obtained by himself from the shales of the red sandstone formation at Wethersfield, Ct. He also made some observations on the numerous and extensive scratches on the surface of the sandstone rocks at Meriden, Ct., the direction of which he ascertained to be from N. 30° E. to S. 30° W., which differ from the usual course of the grooves and scratches on the metamorphic rocks of New England and New-York island, which are from N. W. to S. E.

Dr. C. W. Short presented the 4th supplementary Catalogue of the plants of Kentucky. Dr. C. T. Jackson presented the Report of the Geological and Agricultural Survey of the State of Rhode Island. Dr. Feuchtwanger presented a madreporic group found on our coast; referred to Dr. De Kay for examination. Dr. Torrey, in behalf of Dr. Leavenworth of the U. S. Army, presented a collection of dried plants from East Florida. Thanks of the society were voted to Dr. L. for his valuable donation.

Mr. Halsey presented the larva and perfect insect of the Rhagium lineatum and Tomicus pusillus, small coleopterous insects which prey upon the wood and bark of the pine. Mr. Cozzens presented specimens of Scalaria lineata, Ancyclas and Cyclas, from this island; he also exhibited several fish and insects from a pond near the Deaf and Dumb Asylum; an orange from Florida, covered with the larva of an insect which is very destructive to the orange groves of that country, and a specimen of the Testudo odorata of Le Conte, and the Paludina dissimilar of Say, with its apparently viviparous offspring. Mr. Wheatley exhibited specimens of the Planorbis trivolvis, P. megastoma, and a Physa, found on this island.

The Magazine of Nat. History, No. 34; Audubon's Birds of

America, Nos. 18 and 19; Silliman's Journal, No. 80; the American Repertory, vol. ii, No. 3; and the London and Edinburgh Phil. Mag. No. 110, were received.

The President announced the death of Dr. Boyd, and the following resolutions were adopted:

Resolved, That the Lyceum of Natural History have heard with regret the death of their late associate, Dr. *George W. Boyd*, late assistant geologist in Virginia.

Resolved, That the Lyceum duly appreciate his untiring devotion to the cause of natural science, and especially the valuable services formerly rendered by him as curator to the Lyceum, and his constant usefulness to the society till the time of his death.

Mr. Philip Barker Webb, of Paris, was elected corresponding member. B.

[For the American Repertory.]

REPLY TO THE WRITER "ON THE STEAM-ENGINE."

[Continued from p. 352.]

I intend at an early period to lay before your readers a statement of the results of the application of the Ericsson propeller to the Clarion, in which the consumption of fuel, sectional area of vessel, angles of entrance, speed, and other important facts will be accurately stated. In connection with that account I shall have a very favorable opportunity of disproving the erroneous statement alluded to in my last communication on the subject of the Propeller, Archimedean screw, and common paddle-wheel. Accordingly, it will be necessary to change the order in which I had promised to dispose of the remaining portion of the mistakes by which your correspondent "On the Steam-Engine," has obtained for himself a lasting, though not enviable notoriety.

The striking manner in which you exposed the blunders of your correspondent in the construction of his experimental propeller, and the able manner in which you described the one which it was pretended had been copied, renders it a matter of little consequence how soon the promised refutation appears;

your readers having, moreover, thus been made aware that the experimentalist on the "one-angled" propeller did not even understand the theory of the invention which he had, with his accustomed deficiency of information, condemned as constructed upon unsound principles.

2. *Latent Heat of Steam.*

Relying on the truth and clearness of my demonstration in support of the established theory of latent heat, (see vol. ii, p. 426) I did not think it necessary to notice the argument against it which appeared in a subsequent number. I felt convinced that the attentive reader could not be diverted from the main feature of my reasoning, viz. the inference drawn from the phenomenon attending the transition of water into steam, by the quibble about the supposed great length of the cylinder, which I had proposed to use in the practical illustration of the subject. Indeed it would have been almost an insult to the discernment of the readers of the American Repertory, had I supposed they did not perceive the fallacy of a calculation which gave to the experimental cylinder such preposterous dimensions. It would be curious to know whether your correspondent really wanted the ingenuity of giving a cavity to the bottom of the cylinder, or whether he imagined that the reader would take his statement for granted that the cylinder was purposely placed quite vertical, and its bottom a perfect plane, in order that the water might be, as the basis of his calculation requires, equally distributed all over. I am inclined to the latter supposition; for even a novice in experimental science would at once suggest the propriety of forming the cavity, if for no other purpose than that of containing the bulb of the thermometer.

The shallow expedient of supposing a *cold* and exposed cylinder to be used in the experiment, could not possibly mislead any one; but, on the contrary, furnished strong evidence that the new theory had received a severe shock by my practical illustration, and that its advocate found his case to be desperate.

All this is sufficiently evident, and the truth as to latent heat in steam so clearly defined in my former communication, that

I should certainly not have occupied your pages in discussing this subject any farther, had not your correspondent's infatuation again induced him (vol. iii, p. 265) to advert to my unanswerable demonstration, by the following language: "All this we stated, and it is in accordance with what is commonly—we may say universally—believed, excepting by 'J. E.' who indulges in peculiar ideas on this subject, and just as discreditable to his discernment as was his impracticable contrivance to prove that heat was latent or insensible in steam, and which absurd production thus incontrovertibly proved the reverse of all his assertions, just as his analysis does that of his futile attempt to discredit our position."

I will not comment on the propriety of this sentence, for your readers have by this time been furnished with sufficient data for forming a correct estimate of the true value of your correspondent's reasoning on subjects connected with physical science. The importance of the subject, then, alone induces me to resume the argument, with a view to set the matter at rest. I will take up my original position, only introducing a slight amendment to prevent quibble.

Provide a small cylinder of ordinary proportions, having a tight piston, the weight and friction of which is duly balanced by a counterweight or other contrivance; form a small cavity at the bottom, of the cylinder of about $\frac{1}{8}$ of its diameter and $\frac{1}{20}$ of its depth; surround the cylinder with some substance that can readily be kept at a temperature of 212°; insert the bulb of a thermometer into the cavity, so as to give a correct indication of the temperature in it; let the cavity be filled with cold water, and allow the piston to rest upon its surface; as soon as the water arrives at the temperature of the surrounding atmosphere, say 60°, apply to it fire or the flame of a lamp yielding a uniform heat. The effect will now be that the temperature will gradually increase until it arrives at about 212°, when the curious phenomenon will occur, that notwithstanding the continued application of fire to the cavity, steadily imparting heat to the water contained within, still no farther increase of temperature will take place until the piston has moved so far upward as to leave a space below equal to about 1700 times the volume of water

put into the cavity. I will now ask your correspondent, *What has become of the heat which must have been imparted to the water during the time that the thermometer has remained stationary?* which time will be found to amount to nearly five times as long a period as that which elapsed in raising the temperature up to 212°. In connection with this, the important fact should be stated that the contents of the cylinder and its cavity will, on accurate weighing, be found the same after this great accession of heat as it was when the thermometer ceased to indicate any farther rise: in other words, *no addition of ponderable matter has taken place whilst the thermometer has been stationary, and still, during that period, about five times as much heat has been imparted to the water as that which raised its temperature to the stationary point of* 212°!

On these considerations, it is almost incredible that there should be found even *one* disposed to question the truth of the established theory of *latent heat in steam.* J. E.

NATIONAL ACADEMY OF DESIGN.

REVIEW OF THE EXHIBITION.

(CONCLUDED.)

241. *Miniature Portrait of L. P. Clover, Esq.; by T. S. Cummings*, N. A. The above, as well as all other miniatures painted by this artist, are gems of art, and entitle him to that high reputation which he has so long enjoyed. His miniature of the late President of the Mercantile Library Association, now in the exhibition, if equaled is certainly not surpassed; and his frame, No. 317, entitled *A Mother's Pearls*—a necklace of miniature portraits of the children of a family, shows a versatility of talents seldom attained. We are reluctantly compelled, however, to find fault with No. 246, *The Bijou:* the accessaries are masterly, but the head is evidently not painted from nature, and consequently is void of that individuality for which the artist's other works are so much prized.

Nos. 250 and 254 are both strangely ridiculous.

251 and 255. *Portraits; by J. Nims.* Very pleasing cabinet pictures.

269 and 318. *Engravings; by J. F. E. Prudhomme*, A. Correct copies of the originals, and free from the usual fault of American engravers, (sameness in quantity of shadows.) The aërial perspective is well maintained, and the mechanical arrangement of lines, dots, &c. so managed as to convey accurately the style of the painter.

285. *Portrait; by R. W. Weir*, N. A. This is the first portrait we have seen by Mr. Weir, and he has certainly fully mastered his subject. The accessaries are beautifully subdued, and remind us strongly of those painted by the late lamented G. S. Newton, R. A.

288. *Miniature Portrait of a Gentleman; by H. C. Shumway*, N. A. Mr. Shumway has three miniatures in the exhibition, all of which show great improvement over his former works. Nos. 315 and 321 are his best heads, combining all the force of oil with his usual delicacy of finish and accurate drawing. His works only require to be seen to be appreciated.

311. *Miniature of J. Arthur, Esq.; by J. A. McDougall.* This is a new candidate for fame, and he has certainly run far ahead of what could have been anticipated from so young an artist. No. 311 is a three-fourths length, full of accessaries of the most difficult kind, and such as are seldom attempted in miniature. The position of the figure is easy, characteristic, and accurately drawn; the less important parts well subdued, and so managed as to give full force to the head, which is sweetly colored and an unexceptionable likeness of the original. We have seen some miniatures on paper by this artist which are unique and beautiful. His drawing is fearless, and generally accurate. With close attention to the grammar of his art, "drawing," he will soon be able to select his position among his compeers.

312. *Ameriga Vespucci; by Miss A. Hall.* A truly astonishing picture, full of strength, and painted in the highest scale of color. We have never seen a portrait, painted by a lady, so fearlessly drawn or so boldly colored. Its warmth and identity are so masculine, (for ladies usually paint timidly) that did we not know Miss H.'s merit, we should suppose it the work of a master-hand of the other sex.

319. *A Scene at Paterson, N. J.; by G. O.* G. O. is an

amateur painter, and an enthusiastic follower of the fine arts. His pictures are far above mediocrity, and worthy of his name in full.

THE SCULPTURE.

We acknowledge ourselves incompetent to give an opinion relative to the sculpture of the exhibition. It is so very easy to model a head tolerably well, so difficult to do it exceedingly well, and requires so much knowledge of the art to decide between a good and a superior work, that we decline the task. The head of Inman, by Ball Hughes, certainly bears off the palm; but minor differences are beyond our capabilities.

Our artist readers may have become tired of our frequently pressing upon them the necessity of devoting more attention to drawing; but we feel it to be the besetting sin of American painters to neglect that branch of the art, and this must serve as our apology for so often recurring to the subject. We have been kindly permitted by a friend to publish the following letter written to him by W. ALLSTON, Esq. recommending the course of study for a son who is about to become a painter. The importance of drawing well is set forth by the writer in a manner that cannot fail to convince the student of art.

"*Cambridgeport, Mass. June 15th*, 1841.

"*My Dear Sir*—I received your letter of the 11th May nearly three weeks since, but delayed answering it until the arrival of the box of prints, which has just reached me.

"For this most acceptable present, I beg you to accept my best thanks. They remind me of the spirited etchings of Piranesi, and give more of the character, expression, and general spirit of the Cartoons than any finished engravings I have seen of them. They are such as, I think, must have pleased Raffaelle, had they been done in his time. Hogarth used to say to the engravers whom he occasionally employed to assist him, 'Give me my *character*, if you do it with a hobnail,'—often obliterating weeks of their *fine* work without compunction.

"I wish I could say that the prints which have been engraved from my pictures had anything like the truth of these admirable

etchings; but I have been particularly unfortunate, for (with one exception) neither my character, expression nor effect is to be found in any of them. That from 'Jacob's Dream' gave me an immediate fit of the heartburn, which did not leave me for a whole day. It was engraved for one of the London annuals, by a person who seemed to have had as little notion of the character of the picture as of the human figure.

"I think you are quite right in the opinion that your son should master the elements of our art in the outset. If he does not possess himself of them now while he is young, he will find it hard, if not altogether impracticable hereafter, when he shall become aware of his deficiencies. Let him think no time misspent which he devotes to the human form. Tell him to fag at it until he can draw it with as much ease as he can write: he will then be able to realize his most poetical conceptions; but not till *then*. The great fault in discipline among our young artists is in their beginning to 'make pictures' too soon; to make a *whole* before they are acquainted with the *parts*.

"It is an easy matter to produce a pleasing effect, even of color or *chiaro-scuri*, but not quite so easy to guess right as to form; and he can do no more than guess who attempts it without knowledge. There are hundreds of artists in every age who pass a long life in producing striking effects without an atom of truth in a single component part. Above all, let his progress be *with knowledge;* for only this can secure an artist from the impertinence of ignorance—from being either irritated or disheartened by false criticism. In a word, let him love his art for its own sake, not for the contingent applause, and he will not be satisfied without a thorough mastery of its principles, as well in their minutiæ as their leading points.

"As to Dusseldorf, where you propose sending your son, I can express no opinion. Indeed, I have been so long from Europe, that I know not which is now the most eligible school for young artists. I have reason, however, to think highly of the present German school, from what I have lately seen of some of their works, having been honored with a very magnificent present from Count Rackyinski of Berlin, consisting of his own valuable work on German art, together with numerous

prints from the productions of various living artists of Germany, among the principal of whom are *Cornelius*, *Kaubbach*, *Shnorr*, *Berderman*, and others whose names I cannot at this moment recall. These specimens certainly place the German school very high, especially in purity of taste.

"I am much pleased with the print from Inman. It is a rich composition. If I may be allowed a critical remark, I should say that the quantity of *dark* is too great; there is consequently not enough of middle tint. But this, I apprehend, is the fault of the engraver. I dare say the picture is different in these particulars. Were the engraver here with his plate, he could easily *scrape* down some of the darks, so as to remove the objection.

"You have probably had from Dr. Channing or others some account of my late exhibition, where I had the gratification of refreshing my affections from your little 'Mother and Child,' for the loan of which I now send you my thanks. The kindness that my friends, both abroad and at home, have shown on this occasion is one of those pleasant things to think of in my old age. You mention having the great picture of kind, good Mr. West now with you. There are heads in that picture equal to Raffaelle. Nothing can surpass the high priest and many others. The penitent thief has a sublime expression."

[We have given the letter entire, as everything from the pen of Mr. Allston, relative to the arts, must prove acceptable to American readers.]

PRESERVATION OF WOOD.

As a matter closely connected with wood pavements, the subject of an article in the early numbers of the present volume, and to redeem a promise given in that article, it is our purpose here to describe some of the more effective and easy methods of preparing wood so as to increase its durability in the arts;—first, briefly treating of the cause of that decay in wood against which almost all preservative efforts have been directed, and

the ruling principle which has influenced experimenters in their attempts to discover a means to prevent it.

The great destructive agent alluded to is *dry rot*. Under its effects wood becomes fetid, spongy, discolored—in short, changes all its external features, and is not any longer fit for mechanical purposes. Many kinds of timber used in the arts are the more quickly affected by dry rot, from their possessing a property peculiarly favorable to the development of the disease. There is existing in the sap of such timber a substance known to chemists as *vegetable albumen*, a principle very nearly identical with the white of eggs, the most common form in which we find albumen in domestic and manufacturing operations, and with many of the characteristics of which every reader is familiar. This vegetable albumen easily undergoes decomposition, even after the wood has been seasoned; for while drying, neither the albumen nor any other portion of the sap capable of becoming solidified, has been expelled from the wood, but merely the water in which these matters were suspended. Moisture, confined air, and some other causes assist to decompose it; the two specified, however, are the most active with wood pavements. The change thus begun in the sap affords nourishment to the seeds of *fungi*, affects the fibre of the wood, and speedily results in dry rot. It is from a knowledge of these facts that all or nearly all attempts to prepare wood so as to prevent its decay have aimed either at driving off the watery parts of the sap thoroughly, and filling the pores with some bituminous substance that should exclude the air and moisture; or by the help of some chemical agent, converting the albumen into an insoluble compound, depositing perhaps at the same time a metallic salt in the pores of the wood, that preserves the fibres, and is also a poison to the species of parasitic plants that attend dry rot.

The Kyanizing process, from having attracted more notice than any other, is the first entitled to consideration. Mr. Kyan, the inventor, whose attention had for a long time been turned to the subject of preserving wood, reflecting upon the chemical action of corrosive sublimate upon albumen believed it possible to use that compound in a safe and economical manner for

preventing dry rot. He succeeded fully in showing the great preservative effects of it upon wood—for the few cases of failure recorded are, we think, fairly attributable to other causes, perhaps not understood, rather than to inefficiency in the corrosive sublimate, in favor of which there is, on the other hand, such a mass of testimony—and the practicability of applying it in a manner comparatively unexpensive. The question of safety is however very far from being equally satisfactory. The remarks by Dr. Lee upon this subject, in the Repertory for May, contained in one of his very valuable series of papers upon health and longevity, make it unnecessary for us to do more than earnestly call the attention of those who may be engaged in preparing wood in this manner, or in using wood so prepared, to the directions there given for preventing injurious effects from the poison.

The solutions used by Mr. Kyan vary between 1 pound of corrosive sublimate to 5 gallons of water, and 1 lb. to 15 galls., according to the porosity of the material to be operated upon: the length of time the wood is kept immersed in the solution depends upon its thickness—varying from 3 to 20 days. The reservoir in which the corrosive sublimate is dissolved, and the tank used for saturating the timber with it, are made of thick planks, and the pipes, vessels, pumps, &c. for conveying the liquid from one to the other are formed entirely of wood.

A method of preserving wood by injecting bitumen into the pores, created some interest in this city a few years since, and an association was formed for carrying it into effect upon an extensive scale; but whether the company has carried out the invention so as to realize the expected profit from it to the arts, we cannot say. Perfect success in the operation depended upon a compliance with two conditions:—

1. An exposure of the wood in a bath of coal tar or asphaltum at an elevated temperature, until the sap or other moisture it contained was driven off.

2. Injecting it, when thus prepared, with a solution of either of the before mentioned substances.

It was stated that twelve hours immersion in a bath heated to 212° Fah. would ordinarily suffice to drive off the moisture,

and that by three days exposure to the liquid bitumen the timber would become thoroughly injected.

Prof. Renwick, in a communication to the Common Council upon pavements, makes mention of this mode of preserving wood. He had seen beams of pine, maple and other woods, 12 feet long, that had been injected throughout: some attempts to inject hemlock had not been successful.

In a note appended to the article of Dr. Lee, to which we referred the reader when speaking of the Kyanizing process, brief mention is made of an invention by Sir William Burnett that is superseding the more dangerous one of Mr. Kyan—substituting chloride of zinc* for corrosive sublimate, which is a chloride (the bichloride) of mercury, and, it is said, with equal success.

Sir William Burnett's plan is, to dissolve one pound of chloride of zinc in five gallons of water, letting it stand 10 or 12 hours before using it. The material to be preserved is then immersed for the necessary length of time. Timber is allowed to remain from 10 to 21 days, according to its size and thickness. After being removed from the solution, it is placed in a situation sheltered from the weather until it becomes dry.

If, upon a longer and more full investigation of this discovery than time has yet permitted, it should prove to be equal in efficiency to the Kyanizing process, the benefit conferred upon the arts by it will be inestimable; as, while possessing all the advantages of the other, it has none of the deleterious properties, chloride of zinc being perfectly innoxious.

Dr. Edward Earle, of Philadelphia, has succeeded in giving to wood a greatly increased degree of durability, by immersing it in solutions of the sulphates of iron and copper (the copperas and blue vitriol of commerce.) The former salt, sulphate of iron, is said to be equally if not more efficacious than the latter, and it is much less expensive. We have seen a notice of only one experiment tried with wood so prepared: two pieces of pavement were laid with blocks of hemlock, identical in size, quality, and all else, except that the blocks for one piece had undergone the preservative process of Dr. Earle: an examina-

* Called in the arts Butter of Zinc.

tion was had at the end of 18 months, when many of the blocks that were laid without any preparation to protect them from dry rot, were much decayed, while the prepared blocks were wholly uninjured. The proportions used, and the manipulatory part of this process, we believe, have not been made public.

A novel method of impregnating wood has recently been made the subject of a patent in England, by M. Uzielli. He proposes "to use a natural power existing in trees recently felled, which causes the introduction into all parts of their substance of any liquid, in which their lower extremities are immersed a few inches." Amidst a variety of compounds named, he recommends, for their preservative properties, the unrefined acetates of iron and copper. A bag of water-proof cloth, to hold the solution, is tied about the lower extremity of the tree. The operation is most successful immediately after the tree is felled, and while the leaves and branches yet remain on it.

PROGRESS OF SCIENCE.

The Polytechnic Schools in Germany and France. [From the London Polytechnic Journal.]

Despised by the philosophers of the utilitarian school as the industry of the 18th century now is, the benefits which the present age has derived from it are not to be denied. Our times are eminently practical; but they owe this to the speculative ardor of the men who were among the foremost in the world two and three generations ago. The distinctive characteristic of the 18th century was a passion for truth and humanity; its faith, the human happiness, could only be secured by victories of the intellect. Ennobling as such sentiments are, and beautiful as is such a creed, yet could they not escape the ordinary lot of all that belongs to man; so pure in theory, so innocuous in expression, evil as well as good was mixed up with them, and they conducted many into indifference to Christianity; nay, into doubts of it. Setting this aside, however, it is delightful to contemplate the utter absence of hatred and party spirit with which truth was sought, the firmness and disinterestedness with which all egotistical feelings were suppressed, and the singleness of purpose with which what is now called the greatest happiness principle, was made the end and purpose of all inquiry. Philosophers thought that the proper mode of securing the greatest quantity of happiness was, to make men better men, not richer men only, and to give them a greater capacity for enjoyment, instead of merely endowing them with ampler means for the purchase of enjoyments. These motives governed their educational system, and though they, even as cer-

tain thinkers of our own times, discouraged classical studies, it was not because other pursuits enabled men *cæteris paribus* to earn more wages, but because other pursuits rendered them more able to administer to themselves, without expense or assistance, their individual comforts. The greatest happiness principle is, in our days, the governing motive in all branches of polity; material interests domineer; in estimating success, all impalpable, metaphysical, non-arithmetical elements are rejected; and convertibility into money or money's worth, either immediate or prospective, is the test of value. This is the case on the continent as well as in England; but in England material interests have less influence on education than on the continent, and hence it is that schools of industry, craft schools, if we may imitate the appellative propensities of Mr. Carlyle, abound among the other leading people of Europe, although but few have been established among ourselves.

Institutions for the encouragement of the arts and trades are comparatively of a modern date; establishments for imparting the instruction necessary to artisans, or collaterally advantageous to them, are entirely of a recent date. Improvements were effected, it is true, in their nature wonderful—in their value inestimable; but they were elaborated by the genius and perseverance of single individuals, and were neither hatched by royal patronage, nor produced by a constant and well regulated system of coöperation. These improvements were of a practical nature, but they were either the direct consequence of theoretical discoveries, or discoveries which in themselves amounted to theoretical advance. Now it is in the nature of theory to outrun practice; many of the sciences on which the arts are based are essentially theoretical; and so it happened that the technical sciences had arrived to a high degree of perfection before any one thought of applying them systematically towards perfecting the arts. There are, however, certain arts and trades which the state follows; and when science had gained a sufficiently exalted position, statesmen thought it worth their while to inquire whether science might not render those arts more easy, and those trades more profitable; and then military academies were founded, in which cavaliers were formed, men skilled in the exact sciences; in the construction of roads, bridges and fortresses; in the manufacture of arms, and in the diseases of horses; then follow forest schools and mine schools, and men were taught to administer the production and supply of fuel, and use sound economy in disemboweling the treasures of the earth. Even naval schools were formed, as if sailors were not the creatures of practical life. All these institutions were respectable in their sphere, but it was a limited one; admission to them was not easy; pupils were but too often sent to them because their friends had influence to procure admission; the idea of exclusiveness was always attached to them; and they, therefore, remained without effect on natural culture. So completely, indeed, were such establishments confined to those arts and trades which were carried on by the state, that at the very first free school of this nature established in France, at the school which became the parent of similar ones all over the world, the special public purpose was strictly within the purview of the charter of foundation.

This school was called the "Ecole Centrale des Travaux Publics;"

it was established in 1794, after a plan of Monge, assisted by Fourcroy; and gratuitous instruction in mathematics, natural philosophy, chemistry and drawing was given. In the year 1795 the name was changed to one now known and honored throughout the world, to that of "Ecole Polytechnique;" and rules were laid down which, indeed, tended to diminish the number of students, but, at the same time, gave the surest guaranty for their excellence. The qualifications required in candidates for admission were unusually high, and thus it was ascertained that every student was capable of benefiting from the course of instruction. The idea of making it a preparatory school for government officers soon suggested itself, and was acted on; in the year 1804 the students were domiciliated within the walls of the institution, and a military organization was given to the whole establishment. The age of the pupils averages between 16 and 21 years. At the end of the first year they are called upon to choose some public career; and at the end of the second or third year, those who do not enter the army as sub-lieutenants, or leave for a forest school, or some particular craft school, go to some special school for the artillery and engineers at Metz; for the navy at Brest; for roads, canals and mines, at Paris; or become attached to the geographical division of the "Ecole d'Application du Corps Royal d'Etat-major." The present course extends over two years; the subjects are pure mathematics, mechanics, projections, geodœsia, machinery, political arithmetic, natural philosophy, chemistry, architecture, French, German, and English languages, and drawing. From all this it is evident that the "Ecole Polytechnique" is not a university for the arts and trades. Preparation, both sound and ample, is required in the candidates, and they must have attained the age at which young men usually enter into practical life. The number of students is limited to 300, and is measured by the wants of the public institutions. True it is, that youths will be admitted even though they should announce a determination not to enter the public service; but then the discipline and course of study is uniform, so that those who dislike the public service will in the end enter, or will gradually change their views. In short, this institution, prodigious as have been the benefits that have resulted from it, has but one object in view, that, namely, of supplying the state with useful servants, and differs from the special schools of former times in this only, that it imparts that general technical education which enables every one to devote himself to any particular occupation with the greatest possible chances of success. The services which it has rendered to the technical advancement of the nation are indirect only.

There are craft schools at Chalons and Angers, under the patronage of the king, which purport to give instruction to artisans, as well by exercising them in mechanical operations as by communicating theoretical information. Lectures are given on the French language, arithmetic, the elements of geometry and trigonometry, the application of geometry to joinery and the construction of machines, problems in mechanics, natural philosophy, chemistry, and the theory of strength and power of resistance in building materials. These institutions went through many phases; at one time the theoretical method was predominant, at another the practical; and they, too, had their military epoch. Even now the

pupils are much restrained, and live within the walls, their ages ranging between 15 and 16. At present, practical studies are principally attended to. In these institutions, again, the main object is the education of persons for the public service, for on this plea is the expense incurred for them justified. The whole number of pupils in them is 600, a number too limited to admit of general and wide benefit being the result; and government pays all the expenses of 150, three-fourths of the expenses of another 150, and one-half of the expenses of a third 150. An establishment of greater general utility is the "Ecole Centrale des Arts et Manufactures" at Paris, in which, and at a very small price, students who are acquainted with the elements of algebra and geometry, are instructed in geometry, mechanics, natural philosophy, and chemistry, mineralogy and geognosy, machinery, architecture, industrial economy, the management of mines, commercial statistics, and drawing. The course extends over three years, the students are not resident, and from this establishment chiefly is the country supplied with civil engineers, surveyors, overseers of mines and manufactories, and teachers of technology.

Of a very different nature are the institutions in Paris in which instruction is gratuitously given. The earliest of these were three schools for drawing; they were obviously too few for a city so large; yet, strange to say, they were but ill attended; the pupils were boys between 12 and 14 years of age. Public lectures were then given; at first at the "Conservatoire des Arts et Métiers" in 1819, the subjects being geometry, mechanics, technical chemistry, natural philosophy, political economy, projections and drawing. A collection of models and machines was also thrown open. An institution, principally for builders, bearing the name, "Ecole Gratuite de Mathématique et de Dessein, en faveur des Arts Mécaniques," has also been established; lectures are given in practical geometry, in arithmetical mensuration, in the art of cutting stone and wood, in construction with wooden materials, in the elements of building, in drawing, and in the æsthetic principles of architecture. These examples have been followed in the provincial towns, lectures on hydrography being added at the ports to those already mentioned. The opinion, however, that has been passed upon these institutions is an unfavorable one; they are but little attended, and their utility to those who do attend them is apparent rather than real. All this, it must be confessed, is not surprising; in the first place, that preparation is wanting, without which neither a taste for such means of improvement will exist, nor the power of using them exist; and secondly, the practical bearing of these branches of knowledge on the relations of life is not sufficiently appreciated. Moreover, the instruction is offered to persons who have lost the habit of learning from others; lastly, experience has shown that permanently gratuitous instruction acts discouragingly on the teacher, and does not stimulate the pupil. Not only should the teacher be paid, but the pupil, if a grown up man, should pay him. That knowledge for which a man offers up a portion of his earnings will be steadily pursued and highly prized; the very fact that a man does offer up these earnings proves his sincerity.

Much more important for general advancement than the institution

of which we have spoken is the law of 1833. It ordains that in every town, the population of which exceeds 6000 souls, there shall be a high school, and that the course of instruction shall embrace, at the very least, linear drawing, the ordinary branches of practical geometry, and a popular account of natural history and natural philosophy. Of this anon. From what has been said, it will be seen that every effort is made in France to supply the public service with men of eminence; that something, though by far too little, is effected for the supply of men capable of directing important private undertakings; but no attempt has been made to give to craftsmen, artisans and laborers education and knowledge of a superior order, yet adapted to their pursuits. There are certain branches of technology in which the French excel; but it would puzzle most men to determine whether they excel because of a peculiarity of natural endowment, or of the more plenteous sources of instruction opened to them.

Within the present century, several of the German states have imitated the example of France, Austria leading the way by establishing polytechnic institutions at Prague and Vienna in the years 1806 and 1815 respectively. In the year 1801 the *Ritter von Gerstner* was commissioned by the state of Bohemia to draw up a plan for a polytechnic institution at Prague; he executed that commission, but his views have not been wholly realized. In 1805 a house was purchased, which had formerly been the residence of the noviciates of the Jesuits, and the establishment opened in 1806. The pupils must be at least 14 years of age; the regular course extends over three years, and the qualifications for admission are ability to write, and arithmetical knowledge equal to the solution of problems in the double rule of three. The subjects of the first year are pure mathematics and drawing; the second, mechanics, machinery and drawing of machines, and problems in machinery, both theoretical and manual; of the third, civil and hydraulic architecture, the art of constructing roads, and drawing after models and actual erections. In addition to these, such pupils as may wish it are instructed in chemistry, natural philosophy, mineralogy, the cultivation of fruits, and the science of agriculture. The greater number of the pupils enter the public service; manufacturers, however, are anxious to employ persons who have been thus educated, and the institution having been taken up by the Bohemians as a national affair, is very popular.

The polytechnic institution at Vienna consists of three divisions. The first, called the real school (*Realschule*) has a double purpose—the communication of such knowledge as is sufficient in the ordinary relations of civil life, and the preparation of pupils for the higher divisions. Pupils must have completed their 13th year at least. The course extends over two years, and the subjects are, religion, exercises in reading and writing, German grammar, first principles of mathematics, geography, history, natural history, drawing, the Italian and French languages, and, for those who may wish it, the English, Bohemian, and Latin. The second division is the commercial one; the course is completed in one year. The subjects are, the theory of trade, commercial law, commercial correspondence, commercial arithmetic and book-keeping, commercial geography, the history of commerce, and the knowledge of

wares. The third is the technical division; the course of two years' duration. It embraces, in the first, pure mathematics, natural philosophy, and drawing, theoretical and practical chemistry; in the second, mechanics, machinery, drawing of machinery, and technology. There is a separate course of two years for agriculturists and foresters, as also for land surveyors. Architects are taught machinery, drawing, practical geometry, and geometrical drawing, in the second year; and architectural drawing, technology, and book-keeping, in the third. The pupils of the commercial division are allowed to attend such lectures of the other classes as do not interfere with their own; and lectures, both theoretical and practical, are given in certain of the arts. The appointments of the institution are in every respect splendid. In addition to these, there are in various parts of Austria several institutions for particular crafts and professions.

In Prussia an establishment was founded in 1822, and named the *Gewerbe Institut.* Its object is to give young men of talent an opportunity of acquiring theoretical knowledge in every branch of the arts, and practical familiarity with some of them. The number of students is limited; they do not reside in the institution; they receive stipends from the state, and the instruction is gratuitous. Each provincial department *(Regierungsbezirk)* sends one student annually for admission, and the pupils of the corresponding provincial establishments are, *cæteris paribus,* preferred. The candidates must be at least fourteen years of age, must be able to write well, to speak German correctly and fluently, and cypher decently; if they are journeymen builders, they must have learned their craft practically. There are two classes, and five semestral courses. In the lower, the subjects are arithmetic, geometry, natural philosophy in its connection with mechanics, chemistry in its connection with technology, and drawing. On leaving this class at the end of a year, the students either return to society, obtain permission to complete their education in the laboratories and workshops attached to the institution, or, if they have shown particular abilities, move into the higher class. In this the subjects are, the higher branches of mathematics, machinery, drawing in all its branches, the theory of construction, modeling, metallurgy, forging, turning, casting, &c. Mechanics and chemists attend a sixth semestral course, for the purpose of familiarizing themselves with practice. In addition to this institution, schools for future artisans are established in the principal towns of each department, and in other great cities, at which pupils are admitted after their twelfth year, and taught arithmetic, geometry, chemistry, mechanics, drawing, and modeling. The course extends over three years.

Polytechnic institutions were early introduced into Bavaria, but afterwards abolished. The country is divided into circles, and now, according to the ordinance of February, 1833, a craft school is established in each of them. Each school is divided into three classes or courses; the subjects in the lowest are, arithmetic, including fractions, planimetry, drawing from simple geometrical forms up to the ground plans of machines, natural history, encyclopedia of the arts; in the middle, the application of arithmetic to trade and business, stereometry, drawing, architectural as well as ordinary, natural philosophy, natural history, encyclopedia of the arts; in the highest, arithmetic and algebra, repre-

sentative geometry, drawing, elements of chemistry, encyclopedia of the arts, book-keeping; in addition to these, modern languages, lectures given on geography and history, and practical exercise in modeling encouraged. These schools are to be considered preparatory for those who intend to devote themselves to the more elevated social occupations, and sufficient for ordinary apprentices. The former are invited to pursue their studies at the polytechnic institutions of Munich, Nuremberg, and Augsburg, the course at which occupies three years. In the first, the subjects are drawing in the highest style, pure mathematics, representative geometry, experimental physics, and civil architecture; in the second, drawing, mechanics, technical chemistry, embossing, and modeling; in the third, drawing, mechanics, machinery, representative geometry, the history of the German arts and manufactures, and modeling. Such, at least, is the plan laid down; that it is strictly followed out is by no means certain; but worst of all is, that these institutions do not meet with much favor, and are but ill attended. The love of the king for the fine arts, and his strenuous endeavors to awaken a taste for them, have done much to improve the products of Bavarian industry; and in estimating the merits of the old polytechnic schools, which were rendered useless, and perhaps vicious, by the multiplicity of subjects taught simultaneously, this corrective element must not be neglected.

In the kingdom of Saxony, the schools of Freiberg and Charand have been long celebrated; the former as a mining, the latter as a forest academy. In the year 1828 a polytechnic school was established at Dresden, having in view the same objects as the corresponding institutions of Chalons, Prague, and Berlin. Practical studies are much relied on, although there is no want of theoretical lectures. The subjects are similar to those that occupy attention in the schools which we have already described, except that building is a branch especially favored, that instruction is given in copper-plate engraving, and that there are schools of hydraulic architecture, and the art of constructing roads. Institutions for builders are about to be established at Dresden, Leipzig, and Chemnitz. In the year 1831 the merchants of Leipzig established a school of commerce, at which, in addition to subjects strictly commercial, all branches of technical science that are necessary to a merchant are taught. Craft schools of a humble kind exist at Zwickau, Chemnitz and Plauen; they coöperate with the ordinary burgher schools, but are not well attended. The Sunday schools for young apprentices are well supported, and as well attended. In the poorer parts of Saxony there are established what may be called schools of industry, at which the children are enabled to earn some small wages at the same time that they are learning a trade.

In the kingdom of Wurtemberg there has existed for a long time an institution for the formation of agriculturists; which, undoubtedly, has done good service to the state. In the year 1829, special classes for the education of craftsmen and artisans were added to some existing schools at Stuttgard, and in 1832 a separate establishment for this purpose was formed. The course is completed in three years; the students are called upon to choose their mode of gaining subsistence at the end of the first year, and by the choice the subjects of each person's study are determined. In addition to the branches of knowledge common to

all the institutions of which we have spoken, special instruction is given in the theory and practice of heating. Sunday schools for journeymen and apprentices abound. The capital of the kingdom of Hanover is also endowed with a polytechnic school, similar in plan to those already mentioned as parent institutions, namely, Prague, Chalons, and Berlin. The course for ordinary craftsmen is one of two years for chemists, and mechanical artisans three, and for architects four.

The polytechnic school of Carlsruhe was founded in the year 1825, and enlarged in the year 1832; its pretensions are very great, its plan most comprehensive, and the results up to the present time cheering. The object of the foundation is to impart the necessary scientific instruction to the superior classes of tradesmen and artisans, to prepare young men for the technical branches of the public service, and to educate teachers for the lower craft schools. Mathematics, the natural sciences, and the arts of design, form the basis of the system. A preparatory school, at which pupils of the age of 13 years at least are admitted, is annexed to it. Candidates for admission must be 15 years old at least, and must have an elementary acquaintance with mathematics. After passing through two classes, the second of which cannot be entered by a person under 16 years of age, and unfamiliar with the subjects taught in the first, the student, who will have obtained a considerable amount of theoretical knowledge, either leaves, or enters on the study of some special craft or art. The lectures are so arranged that every person, by following the directions of the professor, will be able to make himself acquainted with all that it imports him to know. The principal divisions are, the school for engineers, that for builders, that for foresters, and that for artisans. In this last, the length of the course depends on the peculiar pursuit which the individual has selected; the natural sciences and technical chemistry are the basis of the studies. The course may extend, according to the wants of each person, over one, two, and three years; practical demonstrations are much relied on, and physical geography is one of the subjects taught. In the capital of Brunswick, the *Carolinum* has been converted into a sort of polytechnic institute, having a technical division, a commercial one, and one for the humanities. The lectures are so arranged that each person may acquire the knowledge requisite for his special pursuit, and at the same time participate in that general instruction which is beneficial to every man.

No one can mistake the community of character that belongs to all these German institutions; the importance attached to drawing, in all its branches, is their salient feature; an excess of subjects naturally distinct, and an excessive subdivision of subjects, whereby unnatural distinctions are created, is their prevailing error. On the subject of drawing we are of the same mind as the Germans; its importance can not be overrated. The ability to draw is a faculty only, it is true; but to him who possesses it, it answers the purpose of an additional sense. But if these institutions propose doing anything more than preparing a man for practice, if they affect to turn out finished workmen or artisans, they will fail sadly; if they do propose more than preparation, they attempt too much. Again, if it be necessary to fill the heads of practical men with a great deal more knowledge than $\frac{9999}{10000}$ of them will ever want, or be able to apply should they want it, the best way of so doing

is to adopt as simple a plan as possible, to avoid mystification of every kind, above all, terminological mystification, and to allow the connection and apposition of the sciences to impress themselves on the mind by means of a natural development of principles, instead of by the startling, but at the same time ill-understood violence of monographical instruction. Thus much of criticism on the general system pursued; now let us estimate the actual results, calculate the probable ones, and observe the difficulties and obstacles with which this well-intended scheme is encompassed.

We have said that the German states imitated the example of France. But why did they so? At first, because the extension of science having given new powers to the arts, managers well versed in the theory of technology, as well as good practical workmen, were required for the public service. It should be borne in mind that in Germany the state is a trader as well as a craftsman; government monopolies are considered fair means of raising revenue; and seeing what a very small quantity of capital there is in the country, how little honored trade is, and how fiercely the passion of stockjobbing rages, government monopolies would appear to be the best means of creating employment for surplus labor. This state of things obtains less in Prussia and Saxony than in Austria and Hanover, but still it does obtain throughout the Germanic confederation, and in no small degree. Again, in a few years after the peace, the sovereigns of Germany began to find out that the manufactories which had sprung up under the protection of the unnatural continental system could not stand competition with those of England and Belgium, into which last country English capital had been carried. The interests, however, that would be affected by the determination of the question whether these manufactories should or should not be preserved, are sustained by a physical power too great to permit any hesitation on the subject. The governments felt that the inland manufactures must be supported; they knew full well that they could not create capital, but they believed it to be in their power to create skill; they felt certain that a knowledge of the principles of his craft could not but be useful, nay, even a source of satisfaction, to every workman; and they conceived that genius itself would not be more slow of development because it was not self-taught. To encourage manufactures, however, it is necessary to make intercommunication regular and expeditious; in other words, to build good roads and to construct canals. Here there arose a necessity for civil engineers, and for men qualified to act under them. To the necessities of the public service, then, and to the consequences of the continental system, must the establishment of polytechnic schools in Germany be attributed. The necessities of the public service have been supplied; the state does possess persons capable of superintending those arts and crafts which a government may, and in some cases should practice; the master manufacturers, too, and the overseers and managers, are men possessed of competent theoretical knowledge, in addition to their familiarity with the application of it; but the system has effected nothing for the mere artisan and laborer; nay, so far as he is concerned, it has utterly and confessedly failed; witness the complaints about non-attendance, witness the establishment of Sunday schools for journeymen and apprentices, as

compliments to the polytechnic institutions. If the working artisan will not attend, it is clear that the system must fail to produce such a race of working artisans as the governments would fain call into existence; if Sunday schools are indispensable compliments to the polytechnic institutions, it is clear that the latter, though conducted on a plan logically perfect and consistent, are useless to certain classes among those for whose benefit they were established, and this because those classes are not capable of receiving the benefits offered them. Nor is such incapacity confined to those who attend the Sunday schools, and who are generally lads or unmarried young men; a large number of those more advanced in life are deterred from attending either the institutions or the schools, because they feel themselves incapable of profiting by them; and their number is not less than that of the persons who are too exhausted by the fatigue of their avocations to summon up the resolution necessary for study. In short, these institutions have failed to accomplish that portion of their scheme which relates to the humblest class of workmen, because that class is not prepared by previous instruction to understand and digest the information communicated to them.

This failure being an admitted fact, and it being also an admitted fact that the system has not failed to produce both master manufacturers and managers in every way superior to those of the generations of which the present is the immediate successor, we may draw the conclusion, that the polytechnic institutions of Germany may be imitated when the production of intelligent and able superintendents is all that is required, but that they should not be imitated when the problem to be solved is, how shall the intellectual potentiality of the mere artisan be increased? Now in our own country it is this last problem that agitates the minds of men. To deny that the master manufacturers are men of great and cultivated powers of mind would be absurd; to impute ignorance, clumsiness, or dullness to the class of superintendents would be equally idle; their success is the best answer that can be given to those who may be bold enough to dispute their fulfillment of the conditions on which perfection in the arts depends; but it must be confessed, notwithstanding the cheering results of the establishment of mechanics' institutions, that the intellectual state of working men does not bear that relation to the moral vigor of their superiors which it should. For the existing generation of workmen nothing can be done by way of education; much may be effected by cheapening knowledge, by throwing open museums on Sundays and holidays in the intervals of service, by establishing zoological and botanical gardens, and by forming collections of models; but in the way of education nothing can be done for them. Something, however, nay, a great deal, may be done for the generations that shall succeed, and this we will endeavor to show.

First, let us get rid of a delusion that is very common on the continent. People there are who believe that craft-schools will succeed; and by this they do not mean to affirm the proposition that a craft can be taught in a school devoted to the exclusive study of it; which proposition is true, but of no practical use to the multitude, seeing that schools cannot be established for each trade or craft; no, they mean to say that schools can be established, in which each boy, in addition to the acquisition of a certain amount of general knowledge, shall be ena-

bled to make himself familiar with the principle and practice of the particular trade or art which he is about to follow. Were such worthy persons in the right, the race of workmen would be rendered more happy, discoveries of the most brilliant kind would be of constant recurrence, and mechanics' institutions would come to be theatres in which difficult subjects are treated in a popular manner; but the whole scheme is Utopian. The very forms of a school are opposed to the nature of craft. The craftsman works alone, and in particularities, not in generalities; he requires directions for individual cases; he wants receipts, patterns, tricks of manipulators, that are only of use in his craft, and sometimes not of general use even in that. Instruction, to be useful to artisans, should be at once general and special; to the special they will be attentive enough, but it is not so certain that they will give heed to what is general. It is not every one that sees the mediate connection between any branch of general science, mathematics for instance, and his particular occupation; if he does not see it, or if he be too lazy to attempt to see it, he may listen indeed, but he will not learn. It must not be forgotten that mediocrity of talent, and a propensity to idleness, are the characteristics of most boys and lads; it should also be recollected, that the less intellectual the sphere has been in which they have moved, the less will they think of mental accomplishments—the more will they pride themselves on manual dexterity—the easier will it be for them to acquire the latter, the more difficult to master the former. It is probable, then, that general knowledge will be received, for it will not be gained without pleasure, and that it will be lost without consciousness. Hence, then, it follows that general instruction must be given to the working artisan before he begins to learn his craft. Now, the majority of lads are set to their craft at an age much too early; the reason is that their parents cannot do without their assistance, or can no longer support them. The establishment of craft schools will not alter this; the boys will still begin, even in the schools, to learn their trades at too early an age; and therefore, as the general instruction must precede the special, it will in most cases be communicated to minds unprepared for the retention of knowledge, if not incapable of receiving it.

We do not believe that schools can be established in which every boy shall be educated according to principles of political equality; in other words, in which every boy shall receive just that education which is best suited to the pursuits which he is about to follow; but we do believe that the pursuits of life may be divided into great classes, and that special schools may be established for each of these classes. When a boy is at school he should be educated, that is, his powers should be so exercised and developed by the communication of knowledge, and the inculcation of principles, that he shall be able to master difficulties and secrets of the occupation which he may select; when he is an apprentice he should be instructed, that is, he should apply his education, and by means of it acquire familiarity with the specialties of the mystery that engages his attention. In conducting education, however, some attention should be paid to the situation in life which a boy is afterwards to fill; the powers necessary to the proper discharge of the duties appertaining to that situation should be more cultivated than others; nay,

it should be seen whether they can be sufficiently cultivated to render the discharge of those duties certain. This will not be possible for every special case, but it will be possible for an aggregate of kindred special cases, that is, for a great class. Now the male population is occupied in labor purely corporeal, or in labor partly corporeal and partly mental; the mental part being devoted to the control of materials, or in labor purely mental. For each of these classes a different system of education is necessary; different in every way, but in nothing differing so much as in the nature of the dominant elements. Education is a preparation for life; the life which we now contemplate is one spent in labor of the second kind; what, then, should be the dominant element in a system of education designed for men who are about to lead such a life? Mathematics surely. The study of mathematics teaches men to look upon all powers as matters of weight, measure and computation; this, which would be a grievous obstacle to the success of men whose labors are purely mental, is of immense assistance to those of whom we speak. Mathematics are the basis of the mechanical arts, even as grammar is the basis of learning; they give the right bent and direction to the mind that inquires into technical mysteries—they keep it from going astray; they enable it to distinguish truth from error. The elements of the science are intelligible to children; nay, more, are easily intelligible; they require attention, and but little more; they partake of the attractions of puzzles, and so may be taught in sport; and their practical utility presents itself to the mind almost hourly. With a knowledge of the elements of mathematics, a boy will not fail to understand the simple operations of his craft at once, nor to comprehend the intricacies of it when they are explained to him. With a knowledge of the elements of mathematics, he will be enabled to pursue a profitable course of self-improvement, to derive great advantages from such opportunities of instruction as may be afforded, to elaborate any suggestions of his own ingenuity or perhaps genius, and to make himself much sooner a useful servant to his master. Lastly, knowing the elements of mathematics, he will not have to encounter those difficulties which frighten unpracticed minds when they first enter on scientific inquiries, which cool their ardor, and which prompt them to seek, in the toils of the day, an excuse for slothfulness in the evening.

The details we may some day enter upon; enough for our purpose if the principle be admitted.

Scouring, or Renovating Articles of Dress. [From Ure's "Dictionary of Arts, Manufactures, and Mines."]

This art has been much more studied by Frenchmen, who wear the same coats for two or three years, than by Englishmen, who generally cast them off after so many months. The workmen who remove greasy stains from dress, are called in France *teinturiers-degrassieurs*, because they are often obliged to combine dyeing with scouring operations. The art of cleansing clothes being founded upon the knowledge of solvents, the practitioner of it should, as we shall presently illustrate by examples, be acquainted with the laws of chemical affinity.

Among the spots which alter the colors fixed upon stuffs, some are caused by a substance which may be described as *simple*, in common language; and others by a substance which results from the combination of two or more bodies, that may act separately or together upon the stuff, and which may therefore be called *compound*.

Simple Stains.—Oils and fats are the substances which form the greater parter of simple stains. They give a deep shade to the ground of the cloth; they continue to spread for several days; they attract the dust, and retain it so strongly that it is not removable by the brush; and they eventually render the stain lighter colored upon a dark ground, and of a disagreeable gray tint upon a pale or light ground.

The general principle of cleansing all spots consists in applying to them a substance which shall have a stronger affinity for the matter composing them, than this has for the cloth, and which shall render them soluble in some liquid menstruum, such as water, spirits, naphtha, oil of turpentine, &c.

Alkalis would seem to be proper in this point of view, as they are the most powerful solvents of grease; but they act too strongly upon silk and wool, as well as change too powerfully the colors of dyed stuffs, to be safely applicable in removing stains. The best substances for this purpose are:—1. Soap.—2. Chalk, fuller's earth, soap-stone or steatite (called in this country French chalk.) These should be merely diffused through a little water into a thin paste, spread upon the stain, and allowed to dry. The spot requires now to be merely brushed.—3. Ox-gall and yolk of egg have the property of dissolving fatty bodies without affecting perceptibly the texture or colors of cloth, and may therefore be employed with advantage. The ox-gall should be purified, to prevent its greenish tint from degrading the brilliancy of dyed stuffs, or the purity of whites. Thus prepared it is the most precious of all substances known for removing these kinds of stains.—4. The volatile oil of turpentine will take out only recent stains; for which purpose it ought to be previously purified by distillation over quicklime. Wax, rosin, turpentine, pitch, and all resinous bodies in general, form stains of greater or less adhesion, which may be dissolved out by pure alcohol. The juices of fruits, and the colored juices of all vegetables in general, deposit upon clothes marks in their peculiar hues. Stains of wine, mulberries, black currants, morellos, liquors, and weld, yield only to soaping with the hand, followed by fumigation with sulphurous acid; but the latter process is inadmissible with certain colored stuffs. Iron mould or rust stains may be taken out almost instantaneously with a strong solution of oxalic acid. If the stain is recent, cream of tartar will remove it.

Compound Spots.—That mixture of rust of iron and grease called *cambouis* by the French, is an example of this kind, and requires two distinct operations; first, the removal of the grease, and then of the rust, by the means above indicated.

Mud, especially that of cities, is a compound of vegetable remains and of ferruginous matter in a state of black oxide. Washing with pure water, followed if necessary with soaping, will take away the vegetable juices; and then the iron may be removed with cream of tartar, which itself must, however, be well washed out. Ink stains,

when recent, may be taken out by washing, first with pure water, next with soapy water, and lastly with lemon juice; but if old, they must be treated with oxalic acid. Stains occasioned by smoke, or by sauces browned in a frying pan, may be supposed to consist of a mixture of pitch, black oxide of iron, empyreumatic oil, and some saline matters dissolved in pyroligneous acid. In this case several reägents must be employed to remove the stains. Water and soap dissolve perfectly well the vegetable matters, the salts, the pyroligneous acid, and even the empyreumatic oils in a great measure; the essence of turpentine will remove the rest of the oils and all the pitchy matter; then oxalic acid may be used to discharge the iron. Coffee stains require a washing with water, with a careful soaping, at the temperature of 120° F., followed by sulphuration. The two latter processes may be repeated twice or thrice. Chocolate stains may be removed by the same means, and more easily.

As to those stains which change the color of the stuff, they must be corrected by appropriate chemical reägents or dyes. When black or brown cloth is reddened by an acid, the stain is best counteracted by the application of water of ammonia. If delicate silk colors are injured by soapy or alkaline matters, the stains must be treated with colorless vinegar of moderate force. An earthy compound for removing grease spots is made as follows:—Take fuller's earth, free it from all gritty matter by elutriation with water; mix with half a pound of the earth so prepared half a pound of soda, as much soap, and eight yolks of eggs well beat up with half a pound of purified ox-gall. The whole must be carefully triturated upon a porphyry slab; the soda with the soap in the same manner as colors are ground, mixing in gradually the eggs and the ox-gall previously beat together. Incorporate next the soft earth by slow degrees, till a uniform thick paste be formed, which should be made into balls or cakes of a convenient size, and laid out to dry. A little of this detergent being scraped off with a knife, made into a paste with water, and applied to the stain, will remove it. Purified ox-gall is to be diffused through its own bulk of water, applied to the spots, rubbed well into them with the hands till they disappear, after which the stuff is to be washed with soft water. It is the best substance for removing stains on woolen clothes.

The redistilled oil of turpentine may also be rubbed upon the dry clothes with a sponge or a tuft of cotton, till the spot disappear; but it must be immediately afterwards covered with some plastic clay reduced to powder. Without this precaution a cloud would be formed round the stain as large as the part moistened with the turpentine.

Oxalic acid may be applied in powder upon the spot previously moistened with water, well rubbed on, and then washed off with pure water.

Sulphurous acid is best generated at the moment of using it. If the clothes be much stained, they should be suspended in an ordinary fumigating chamber. For trifling stains, the sulphur may be burned under the wide end of a small card or paper funnel, whose upper orifice is applied near the cloth.

Manipulations of the Scourer.—These consist, first, in washing the clothes in clear soft water, or in soap water. The cloth must be next

stretched on a sloping board, and rubbed with the appropriate reägent as above described, either by a sponge or a small hard brush. The application of a red-hot iron a little way above a moistened spot often volatilizes the greasy matter out of it. Stains of pitch, varnish, or oil paint, which have become dry, must first be softened with a little fresh butter or lard, and then treated with the powder of the scouring ball. When the gloss has been taken from silk, it may be restored by applying the filtered mucilage of gum tragacanth; stretching it upon a frame to dry. Ribbons are glossed with isinglass. Lemon juice is used to brighten scarlet spots, after they have been cleaned.

Popular Views and Economical Applications of Geological Science.
By W. E. Hall. [From the "Mechanic and Chemist."]

[CONTINUED FROM PAGE 216.]

AGRICULTURE.

Soils and Manures.—The benefits which geology can confer on agriculture are neither few nor trifling. The space to which I am limited will not permit me to point out in detail how the nature of a soil depends on that of the rocks from the disintegration of which it was derived; nor to show how particular plants affect particular soils, in which in a state of nature they exclusively flourish, and in which they flourish most in a state of cultivation; so that by consulting a good geological map of a given district, we may predict before we enter it the species of crops which will be found most extensively cultivated there, and which experience has proved to be best adapted to it.

A due mixture of the earths in a soil is essential to its fertility. The most productive districts of England have been made so by nature, and owe their fertility to this mixture; and it is by copying nature that we must proceed in our endeavors to improve those that are barren. Neither pure clay, sand nor chalk afford productive soils. Those are the best which contain a mixture of the three earths—silica (sand), alumina (clay), and lime, with a portion of decomposed animal and vegetable matter. These are the soils which will bear repeated cropping without dung or other rich manures, to recruit the loss produced by vegetation.

The principal ends proposed in agricultural improvements are, to render wet soils dry, and dry soils sufficiently moist; to render adhesive soils loose, and loose soils sufficiently adhesive; and the proportion in which the earths above mentioned should be mixed for these ends, must depend upon the climate and the substratum. Aluminous soils retain too much moisture, and silicious soils part with it too rapidly; and a soil, good in itself, may be rendered unproductive by resting on too retentive or too porous a substratum. Draining or irrigation are, in such cases, the remedy. When one of the earths prevails in a soil to the exclusion of the others, great improvement may be effected by the addition of that which is deficient; and it is astonishing that the superior fertility observable along the line of junction of two rocks, occasioned by the mixture of their component parts, has not oftener induced agriculturists to have recourse to various artificial mixtures of the materials of rocks adjacent to each other. There are districts in

which such mixtures have been practiced with the greatest success; but, in general, farmers rely too exclusively on farm-yard manure. Clay, sand and limestone are, nevertheless, mineral manures of the greatest value, and have changed the face of whole districts that were before comparatively barren. By such mixtures the constitution of the soil has been improved, causing the animal and vegetable manure afterwards applied to be more efficacious. For instance, the clay lands of Essex have been greatly improved by the use of chalk; and in Norfolk and Suffolk, large tracts of land, which were before incapable of bearing corn, have by the application of clay been made to produce good crops of wheat, barley, clover and turnips. Thus a greater number of cattle are kept upon a given area, and the quantity of animal and vegetable matter returned to the soil is proportionally increased.

The mineral manures are in general too much neglected, with the exception of lime (the injudicious use of which too often runs into the abuse); and even in those districts where they are applied, they are frequently brought from a distance, when, though not visible on the surface, they exist at a small depth below it, sometimes under the very field for the improvement of which they are required. Now who, I would ask, is most likely to discover them—he who never looks deeper into the earth than the bottom of his ditches, or he who studies the position of rocks with respect to each other, and for this purpose examines every natural section by which they are exposed to view in cliffs and ravines, and every artificial section laid open by mines, wells, and other excavations?

It appears unnecessary to extend these proofs of the value of geological principles to the agricultural and mercantile interests of a nation. One of the most obviously useful applications of science is in the colonies, sent forth by a commercial people; and perhaps no more important service could be rendered to Australia or Canada than by accurate geological surveys, such as are now proceeding steadily in several of the United States of America.

Composition of Crucibles. [From Ure's "Dictionary of Arts, Manufactures, and Mines."]

The best crucibles [according to Dr. Ure] are formed from a pure fire clay, mixed with finely ground cement of old crucibles, and a portion of black lead or graphite. Some pounded coke may be mixed with the plumbago. The clay should be prepared in a similar way as for making pottery ware. The vessels, after being formed, must be slowly dried, and then properly baked in the kiln. Crucibles formed of a mixture of 8 parts in bulk of Stourbridge clay and cement, 5 of coke, and 4 of graphite, have been found to stand 23 meltings of 76 pounds of iron each, in the Royal Berlin Foundry. Such crucibles resisted the greatest possible heat that could be produced, in which even wrought iron was melted, equal to 150° or 155° Wedgewood; and bore sudden cooling without cracking. Another composition for brassfounding crucibles is the following:—Half Stourbridge clay, one-fourth burned clay cement, one-eighth coke powder, one-eighth pipe clay. The pasty

mass must be compressed in moulds. The Hessian crucibles, from Great Almerode and Epterode, are made from fire-clay, which contains a little iron, but no lime; it is incorporated with siliceous sand. The dough is compressed in a mould, dried, and strongly kilned. They stand saline and leaden fluxes in docimastic* operations very well; are rather porous on account of the coarseness of the sand, but are thereby less apt to crack from sudden heating or cooling. They melt under the fusing point of bar-iron. Beaufay, in Paris, has lately succeeded in making a tolerable imitation of the Hessian crucibles, with a fine clay found at Namur, in the Ardennes.

Berthier has published the following elaborate analysis of several kinds of crucibles:—

	Hessian	Beaufay	English for Cast Steel (not kilned)	St. Etienne for Cast Steel	Glass Pots at Nemours	Bohemian Glass Pots	Glass Pots of Creusot
Silica	70.9	64.6	63.7	65.2	67.4	68.0	68.0
Alumina	24.8	34.4	20.7	25.0	32.0	29.0	28.0
Oxide of Iron	3.8	1.0	4.0	7.2	0.8	2.2	2.0
Magnesia	Trace	—	—	Trace	Trace	0.5	Trace
Water	—	—	10.3	—	—	—	1.0

Wurser states the composition of the sand and clay in the Hessian crucibles as follows:—

Clay.—Silica 10.1, alumina 65.4, oxides of iron and manganese 1.2, lime 0.3, water 23.

Sand.—Silica 95.6, alumina 2.1, oxides of iron and manganese 1.5, lime 0.8.

Blacklead crucibles are made of two parts of graphite† and one of fire clay, mixed with water into a paste, pressed in moulds and well dried, but not baked hard in the kiln. They bear a higher heat than the Hessian crucibles, as well as sudden changes of temperature; have a smooth surface, and are therefore preferred by some melters of gold and silver; but they are not universally employed by casters of those metals.

Mr. Austey describes his patent process for making crucibles as follows:—Take two parts of fine-ground raw Stourbridge clay, and one part of the hardest gas coke, previously pulverized and sifted through a sieve $\frac{1}{8}$ of an inch mesh: if the coke is ground too fine, the pots are very apt to crack. Mix the ingredients together with the proper quantity of water, and tread the mass well. The pot is moulded by hand on a wooden block, supported on a spindle which turns in a hole in the bench; there is a guage to regulate the thickness of the melting pot, and a cap of linen or cotton placed wet upon the core before the clay is applied, to prevent the clay from sticking partially to the core in the taking off. The cap adheres to the pot only while wet, and may be removed without trouble or hazard when dry. He employs a wooden

* Docimacy is the analytical examination of ores. † Blacklead.

bat to assist in moulding the pot. When moulded, it is carefully dried at a gentle heat. A pot dried as above, when wanted for use, is first warmed by the fireside, and is then laid in the furnace with the mouth downwards, the red cokes being previously damped with cold ones in order to lessen the heat; more coke is then thrown in till the pot is covered, and it is then brought up gradually to a red heat. The pot is next turned and fixed in its proper position in the furnace, without being allowed to cool, and is then charged with cold iron; so that the metal, when melted, shall have its surface a little below the mouth of the pot. The iron is melted in about an hour and a half, and no flux or addition of any kind is made use of. A pot will last for 14 or even 18 successive meltings, provided it is not allowed to cool in the intervals; but if it cool, it will probably crack. These pots, it is said, can bear a greater heat than others without softening, and will consequently deliver the metal in a more fluid state than the best Birmingham pots will.

The melting pots used at the Mint are made of cast iron, and hold conveniently 400 pounds of metal. Platinum crucibles are employed for some chemical purposes, but they are unfit for melting metals. Ib.

Woody Fibre, its Structure and Uses; Report of a Lecture delivered before the Society of Arts, by ARTHUR AIKIN, Esq.

Vegetables are composed of certain elementary organs, viz. cellular tissue, woody fibre, spiral vessels and ducts. The woody fibre is formed by fibres sent down from the leaves into the stem, somewhat after the manner of roots into the earth. The arrangement of these fibres varies according to the different classes. In the *out-growing* trees, (Exogens) such as forest trees, a horizontal section of their stems exhibits the concentric mode of arrangement (that is circle without circle) each of which corresponds to a year's deposit of woody matter, constituting in botanical phraseology a zone. In the *in-growing* trees (Endogens) palms and natives mostly of warm climates, no such arrangement takes place, a confused mass of woody fibre being alone observed, when examined in a similar manner to the former. To separate woody fibre, it is requisite to macerate or soften wood in water or weak acid, when the agglomerated fibres become distinct, and may readily be detached by a fine needle. When the fibre is subjected to microscopic examination, it will be found to be composed of a hollow tube tapering at each end (fusiform) one end of which partially overlaps its neighbor. The diameter varies very considerably in the common lime tree, it is from $\frac{1}{100}$ to $\frac{1}{150}$ of an inch; this is about the usual average of the fibre of our native trees. It possesses great elasticity, a single fibre may be bent double without rupturing—which is not however the case when they are in a mass. There is considerable variety as to the degree of flexibility of woods; in the spring, when the sap is in the stem and the vital parts of the plant are in full action, the wood is much more brittle, and is on the contrary much less so in the autumn and winter, when the vital actions to a certain extent cease.

Woody fibre is rendered more flexible when (after it has been dried) it has been soaked in water; it is on this account that ship-builders

steam their planks before applying them to the hull of the vessel—and also, that osier workers steep their willow twigs in water prior to using them for basket making, &c. The most flexible of the British trees are the hazel, the beam tree, the dogwood, and the willow. Considerable difference is also found in the degree of rigidity between the fibres of the root and that of the stem. In the remote parts of Ireland and Scotland, the peasantry dig up the roots of fir, which have been buried for ages in some of the bog earth, and from them obtain fibre of sufficient strength to form ropes for various purposes, such as for harness, &c. The roots of the liquorice *(Glycyrrhiza)* contain, in addition to a large proportion of mucilage, a considerable quantity of woody fibre, and is readily separated by repeated washing and boiling; by this the mucilage is dissolved and the fibre remains. In cases of need, this plant might be most advantageously cultivated for this purpose.

Fibre is chiefly, however, obtained from the bark of plants. The bark of the lime tree is manufactured into very serviceable shoes by the Russian peasantry. The *bass* or *matting* of the gardens is obtained by macerating the stems of the lime tree in Russia, and separating the inner part of the bark *(liber)*; it is then cut into strips and matted together. In the genus Daphne, to which the Mezereon belongs, there is a natural tendency of the fibres to cross each other, as in the Lace Bark Tree (Daphne Laghetto) of Jamaica. This singular structure *(liber)* exactly resembles very delicate lace, and is manufactured into various articles of dress in the West Indian islands. When macerated in water, and the fibres separated, it is used for veils, gloves, &c; but when first separated without being opened, it makes excellent trowsers, and cordage when twisted.

In addition to the plants already alluded to, of the genus Daphne, as yielding fibre of a peculiar and delicate texture, the Daphne Nepalensis of Nepal is much employed in that country for the manufacture of paper. When prepared it is not very smooth, but it possesses advantages over that made in the ordinary manner, as it is not preyed upon by the white ant, which destroys to an incredible degree documents in the East Indies; there is either some peculiar smell or taste obnoxious to this depredator. The natives of Otaheite make of the bark of the Bread Fruit Tree &c. clothing suitable for the temperature of the climate. In China and Japan the bark of the Paper Mulberry is made into their very best kind of paper: in its native state it is in streaked layers, and is sometimes dyed red and printed of various patterns, given to it by means of raised bats.

Mr. Aikin then proceeded to explain the history of flax and hemp. Linen and woolen cloth was known in the oldest times, and it is supposed that women were probably the first who wore linen robes, while men were clothed in woolen.

The fibre is obtained from the flax, *Linum usitatissimum,* by cutting the stems when the seeds are ripe, tying them in bundles, macerating them in water until the cuticle or epidermis is loosened, and then beating them with large bats to separate the fibres. This was the process adopted in ancient times, and is adopted up to the present day, with the simple improvement of boiling the stems in an alkaline solution, in order more readily to separate the fibres and to destroy the coloring matter.

In the silk handkerchiefs obtained from India, the harsh fibre of the fabric depends on a portion of the natural gum which remains on its surface, and to a certain extent resists the edge of the knife: it is on this account that handkerchiefs of this kind are sought after by men-of-war's-men, to tie round their heads in action, with the idea that it would prevent the infliction of a wound on that part of the body, should their opponent strike at it.

Hemp was likewise known to the ancients. All cordage used for rigging of ships, for twine, &c. is made of this fibre. It was formerly cultivated in this country to a considerable extent; much, however, is imported from Italy, the fibres of some kinds of which measure from 7 to 8 feet long. Italian hemp was a few years ago in low estimation in the market as compared to Russian and other kinds. It sells now for about £60 per ton. It is chiefly used for the manufacture of linen cloth in England, Ireland, &c. and is now rising in the estimation of the manufacturers.

Government, some years since, endeavored to cultivate hemp to some extent in Canada. Bombay furnishes hemp of good quality, sufficient for the uses of shipping in those parts. It is also grown in China: a specimen was exhibited of a soft and very white color, obtained from those parts. Our shipping is principally supplied by the hemp imported from Russia. Many very superior specimens of this article were on the table, grown in our own country and in the British dominions in foreign parts.

The common stinging nettle *(Urtica)* is very nearly related (botanically considered) to hemp; the fibre obtained from it is good, and clothes have been made from it. A similar plant in Sumatra rises to the height of from 4 to 6 feet, and when cut down and prepared yields fibre of excellent quality for most purposes.

The hopvine of the common hop, after the strobiles have been picked, when macerated in water yields a brownish fibre applicable for many purposes. The principal objection to this material is the brown color, which is not easily discharged. Mr. Aikin thinks it would answer well for hop-bags, twine, and coarse cloth: it is harsh to the feel.

The sun hemp of India is much cultivated for its fibres, which, when the plant is in seed, are of the greatest tenacity. The weaker fibres obtained from the several plants mentioned are of less price than the stronger, and are much used to adulterate the stronger hemp and flax.

The plants of the mallow tribe *(malvaceæ)* are remarkable for the fibre of their bark. That separated from the Hibiscus Cannabinensis, when woven in India, is known as glass cloth.

The bowstring hemp, of India, is obtained from the fibres of the bark of Asclepias tenuissima. It is made into bow-strings, cloth, &c: the strongest description is obtained from an American aloe *(Agave.)*

The leaves of the tribe of *Bromeliaceæ* yield a very strong and elastic fibre, such as that obtained from the genus *Agave* or American aloe, the fibre of which is long and clean. The white cables of Manilla are prepared of it.

The sugar pine of Jamaica yields a very fine fibre. Of the Phormium tenax, or New Zealand flax, much discussion has arisen on the degree of tenacity of the fibre of this plant as contrasted with the Russian arti-

cle; by many it is considered inferior. It is said to be a very inferior article when manufactured into sail-cloth, as it absorbs water readily, and causes the fabric to rot much sooner. If boiled in an alkali, this objection is partially removed. When examined under the microscope the fibre of cotton is observed to be very hollow; that of New Zealand flax more solid; and that of common flax appears to be manifestly composed of a congeries of small fibres adhering together, thus accounting for its superior strength. The delicate fibre obtained from the musa or banana is nearly the finest of all the useful kinds, and when manufactured yields a cloth, cambric, or muslin of better quality than any other. The leaves of some palms afford fibres firm enough for cordage, and others for baskets. The nut of Cocos nucifera is inclosed in a mass of fibres which afford the materials for the floating kaya rope, the cables holding a ship in a storm for a much longer period than any other kind.

Hydraulic Cements and Factitious Stone. [Selected from the Moniteur Industriel.]

M. Kuhlmann of Lille, a distinguished chemist, has made a discovery which promises to be of great importance in building, and for other purposes. At a late meeting of the French Academy of Sciences, the nature and results of his researches were stated. In many communications previously made by him to the Academy, he has considered the efflorescences on walls, their nature, origin, and the circumstances which cause their formation; by which the presence of salts of soda or potass is shown in the greater part of the limestones of all geological formations. He has made experiments on different cements, and they all presented decided signs of the presence of potass. It was by following up these observations that M. Kuhlmann was led to undertake a new series of researches, the remarkable results of which he communicated to the Academy. In the first place, he directed his attention to artificial hydraulic limestones made in the dry as well as in the humid way. In both methods of operating he succeeded in producing very economical hydraulic mortars, by adding to lime or chalk sulphate of alumine or alum. It thus constitutes an aluminate of lime. M. Kuhlmann has found that on placing chalk in contact with a solution of alkaline silicates, even when cold, a certain exchange of acids ensues between the two salts, and that a part of the chalk is transformed into silicate of lime, a proportional amount of potass passing into the state of carbonate of potass. If the chalk in powder has been thus partially transformed into silicate of lime, the paste which results from this transformation hardens by degrees on exposure to the air, and becomes as hard, or even harder, than the best hydraulic cements; it is, in fact, an artificial stone, which, when it has been prepared in a paste sufficiently liquid, and with a sufficient quantity of silica, has the property of strongly adhering to the bodies to the surfaces of which it is applied. Thus the silicate of potass or soda might serve to prepare mastics analogous to cements, without its being necessary to calcine the chalk. These mortars appear to be applicable in certain circumstances to the restoration of public monuments, to the formation of casts, &c.

Of all the results obtained by M. Kuhlmann, the following appear to be the most interesting. When, instead of presenting the powder to the solution of alkaline silicate, it is presented in a .paste of sufficient consistence, an absorption of silica also takes place, and in quantities that may be varied at pleasure. The masses of chalk increase in weight, become shining, of a rough grain, and the color is more or less yellow, according as they are ferruginous. The immersions may be either cold or hot, and a few days of exposure suffice to transform the chalk into siliceous limestone so hard as to scratch some marbles; the hardness gradually increasing by exposure to the air. Even from three to four per cent of absorbed silica gives a great hardness to the chalk.

The stones thus prepared are susceptible of a beautiful polish. Their hardness, which is at first superficial, penetrates by degrees to the centre, even when the mass is a thick block. On account of their hardness, and their fine and uniform grain, the chalks thus prepared appear capable of becoming of great use in works of sculpture, and in different ornaments even of delicate workmanship; for when the *silicazation* takes place in chalk that is very dry, which is requisite to obtain the best effects, the surfaces are never altered by the weather.

M. Kuhlmann has made attempts to apply these stones for the purposes of lithography, and the first results of his experiments promise complete success.

This method of transforming soft limestones into siliceous limestones may be applied most advantageously in building. Ornaments which would be unchanged by the rain, and of great hardness, might be obtained at low prices, and in many cases a plaster made with a solution of silicate of potass might serve to preserve from further decay ancient monuments composed of mortar or of soft limestone. The same plaster might become of general use in countries where chalk forms almost the only building material.

The inventor has extended his process to carbonates of barytes, strontian, magnesia, lead, &c. in which the same reäctions take place, and he obtained analogous results.

Plaster has also been an object of M. Kuhlmann's researches. The decomposition of plaster in silica is still more rapid and more complete than that of chalk. Plaster cast in a mould, and immersed in a solution of silicate of potass, becomes very hard, and has a very remarkable shining appearance; but if the transformation is too rapid, this is only superficial, and after exposure to the air for some days, the surface peels off with the least touch. In order therefore to *silicitize* plaster, it is requisite to operate with very feeble solutions; and it is also very important to render the plaster more porous by the introduction into it of foreign matters, such as chalk, fine sand, &c. The siliceous liquid may then enter into the paste itself, to complete the silicization afterwards by immersion. M. Kuhlmann, in reference to the formation of natural calcareous silicites, enters into some considerations to show that nature appears to have had recourse to transformation analogous to those now pointed out as the means of producing factitious stone. His researches tend to prove that the silicate of lime which accompanies chalk has no other origin than that resulting from the filtration of the silicate of potass or soda in a state of solution in water.

MISCELLANEOUS.

FOREIGN.

Improvements in the Loom.—These improvements, which are four-fold, relate to power looms. The first is in the mode of giving off the warp, which is effected by the following arrangement:—Two revolving rollers and an intermediate one are placed at the lower part of the back of the loom; the former are covered with woolen cloth, and one of them being connected with the main shaft of the loom, drives the other through the medium of toothed gearing and a small pinion fixed between them, causing them both to revolve in the same direction. The warp threads are passed round these rollers, thence over a roller at the top of the loom, and are then fastened to the cloth beam; by which means the warp threads are given off in a more steady and uniform manner than usual.

Secondly, for taking up the work a worm wheel is fastened on one end of the cloth beam, which is driven by a worm on one end of a horizontal shaft, extending towards the back of the loom, and having at the other end two cog-wheels turning loosely on the shaft; alongside of each cog-wheel a ratchet-wheel is fixed to the shaft, being turned by a click from the cog-wheel when turned in one direction, but when turned in the opposite direction the inclined ratchets permit the click to slide over them. The cog-wheels are turned by means of racks in two vertical rods suspended by pin-joints from horizontal levers at the top of the loom; the lower ends of the rods are forked, the forks receiving between them a stud on the sides of two cams, which causes them to rise or fall alternately. The falling of one rod turns the horizontal shaft half-way round; it then rises; the descent of the other completes the revolution; thus giving a continuous rotary motion to the horizontal shaft and work beam. The two horizontal levers at the top of the loom are hollow, and have each a slot in their under side throughout their length; a screw is placed within, to which a slow rotary motion is given, and suspended from this screw is a weight which passes through the slot and hangs below the lever; by the rotation of the screw this weight traverses from the axis to the extreme end of the lever, which gives a continually increasing leverage for winding up the cloth beam as it gradually increases in size.

The third improvement is an ingenious contrivance for stopping the loom whenever the weft thread breaks or is expended; for this purpose the weft thread passes first from the bobbin through a ring in the shuttle, and then through a hole in the end of a horizontal spring-lever which has a constant tendency to protrude through the side of the shuttle, but is kept back by the tension of the weft thread as long as it remains whole; but the moment it breaks or fails, the lever being set free, projects through the side of the shuttle, and on entering the shuttle box liberates a spring lever which causes a forked rod to shift the driving band from the fast to the loose pulley, and thus stops the loom.

Lastly, the following arrangement is described for changing the

shuttles in the event of a thread breaking or being used up: the shuttle box is composed of a drawer with two cells, one of which contains a spare shuttle ready charged; this drawer is constantly pulled in one direction, but is prevented from moving by a spring stop; on the working shuttle entering its cell with the thread broken or expended, the horizontal lever which projects through the side of the shuttle strikes against one end of a short lever, the other end of which draws back the spring and releases the drawer, which is immediately pulled forward, the charged shuttle taking the place of that which has been rendered *hors du combat*. Mech. Mag.

Lubricating Mixture.—The following anti-friction mixture has been recommended for railway wheels and other machinery. It is stated not to liquify by heat; if so, it is a great advantage:—Blacklead powder, fifty parts by weight; hogs' lard, the same; fresh soap, the same; quicksilver, five parts. The lard and mercury are to be well mixed in a mortar, and the blacklead gradually added, after which the soap is to be mixed in. Railway Journal.

Benkler's New Oil-Gas Lamps.—This invention, according to Dr. Liebeg, professor at Giessen, may be considered as one of the greatest improvements in lamps since the Argand. It principally consists in feeding the flame with heated air, and directing it at a certain angle to the base of that flame, by which means it is not liable to become cooled by exposure to currents of air which do not assist the combustion. In the Argand lamps it is not only the air requisite to supply the flame, which enters into the chimneys of glass, but almost double and even triple the quantity of atmospheric air enters also, which has an injurious effect on the combustion. These useless currents of air affect the quality of the light, for as the air becomes heated by the flame, it deprives the latter of a part of its heat and a proportionate quantity of its illuminating power. Thus one of the most interesting problems in the theory of illumination has been to avoid this cooling, and consequently to increase the brightness of the light. This problem Benkler has solved in the most extraordinary, the most simple, and the most beautiful manner. In Benkler's lamp the flame is brought to a white heat. The power of its light can only be compared to the flame of phosphorus burning in oxygen, which it nearly equals in clearness and brilliancy. The apparatus of Benkler is applicable at very little expense to lamps of every description. Any kind of oil may be used, even the commonest whale oils. They produce a flame which is quite as free from smell as that of the purest oil.

Discovery of Platina.—The Port Philip Herald states, that Mr. Neville, of the customs, has discovered a metal, supposed to be platina, in the fissure of a rock about 18 miles distance from Melbourne. It is heavier than iron, being 11 times more weighty than water. Several chemists have been attempting to analyze it, but without effect. Mr. Neville says that he could load several ships with it, in such quantities had he seen it. It is somewhat singular that Mr. Neville discovered the same metal, but not of so pure a quality, on the Sydney side of the

country, some months ago, and as the chemists could not analyze it there, he sent it home to England, but has not yet heard of the result of his speculation.

New Mode of making White Lead.—This invention consists in the application of carbonate of lime to certain salts of lead, in such a manner as to produce decomposition of the salts of lead, and a reciprocal exchange of acids and bases, between the carbonate of lime and the salt of lead employed. By the chemical reäction, carbonate of lead (white lead) is obtained, and a solution of salt of lime, the composition of which depends on the particular salt of lead made use of in the process.

The inventor employs a mill called a "flint mill," which is well known and in constant use at potteries. Into a mill of this kind, 12 feet in diameter, and three feet deep, is put 21 cwt. of chloride of lead, and 7½ cwt. of carbonate of lime; a convenient form of which is, that of the best washed chalk or whiting; the tub is then filled with water to within 15 inches of its edge. The mill is then set in motion, and the materials are ground together during from four to six hours; after which the grinding is discontinued, and water is added till the tub is nearly full. The whole is then allowed to stand till the next morning, when a white mass will be found at the bottom of the tub, which consists of carbonate of lead mixed with undecomposed chloride of lead and carbonate of lime; and above it a clear liquor, which is a strong solution of chloride of calcium, nearly free from lead. This clear liquor is drawn off by a syphon, and the tub is nearly filled with water; the grinding is then continued for a few hours, after which it is suffered to stand till the next morning. This process is carried on in the same manner day after day, the chloride of calcium in the liquor gradually getting weaker, until at the expiration of from seven to fourteen days it is nearly tasteless; the process is then complete.

The white mass at the bottom of the tub is carbonate of lead, which is removed from the tub and dried, and prepared for the market in the usual manner.

When making white lead with water saturated with carbonic acid gas, the inventor operates in the following manner:

A barrel is provided, either of lead, copper, or wood, four feet in length by 2½ feet in diameter, well hooped with iron, and bound at both ends, to resist the necessary pressure; the barrel is suspended on gudgeons, on one of which is a "live and dead pulley," to which a strap is carried from any suitable machinery, so that the barrel may be made to revolve at pleasure. There is a hole through the other gudgeon into the barrel, and just beyond the bearing part of the gudgeon is a stop-cock. This gudgeon is connected by a screw-joint with a forcing pump for forcing carbonic acid gas into the barrel.

The inventor introduces through an opening in the side of the barrel 140 lbs. of chloride of lead, and 50 lbs. of carbonate of lime, and nearly fills the barrel with water; the opening in the side of the barrel is then closed, and by means of the forcing pump the water is saturated with carbonic acid gas, under a pressure of from five to six atmospheres, and the barrel is then caused to revolve.

The substances begin immediately to reäct on each other, the carbonic

acid solution dissolving the carbonate of lime, and presenting it to the chloride of lead in a form to be immediately decomposed.

At the end of four days, the decomposition being nearly complete, the substances in the barrel are allowed to settle. The solution of chloride of calcium is then drawn off, and the barrel again nearly filled with water, saturated with carbonic acid gas. At the end of another day or two the process is complete. The lead is then taken out of the barrel, and prepared in the usual manner.

When using nitrate of lead instead of chloride of lead, the proportions are as follows: When operating with water only, $24\frac{9}{10}$ cwts. of nitrate of lead, to $7\frac{1}{2}$ cwts. of carbonate of lime. When using water saturated with carbonic acid gas, 166 lbs. of nitrate of lead to 50 lbs. of carbonate of lime. Inventor's Ad.

Smallest Steam-Engine in the World.—We have been gratified with the sight of a model of a high-pressure steam-engine, beautifully executed in silver by Mr. John Mitchell, a working engineer of Redruth, the cylinder and parallel motion of which stand within the circumference of a fourpenny piece! The cylinder is but one-tenth of an inch in diameter, the whole machine weighing but the eighth of an ounce, and a tea-spoon full of water sufficing to set the machinery working (by crown wheel gear) with a force and velocity altogether amazing. There is a novelty in the construction of the slide valve, of which it would be difficult to give a description which would be intelligible to the general reader, but which evidences an ingenuity in designing, and a skill in workmanship, which we hope will be employed in future in works of greater magnitude and importance. West Briton.

New Musical Instrument.—The *Fanal* mentions the invention of a new musical instrument by M. Sax, which promises to satisfy with its volume of sound the most noise-loving of musical ears. It is described to be a contre-bass clarionet made of copper. The *Fanal* says, "we have heard it, and we can affirm that, after thunder, it is the most powerful bass that exists. Its round, full vibrating sounds completely fill the ear, and satisfy the most gluttonous musical appetite. It is a river of harmony overflowing its banks. The saxophone is the Niagara of sound."

A Galvano-Arsenical Apparatus.—Mr. S. T. Martin, of the Royal Veterinary College, exhibited at the last meeting of the Royal Institution this apparatus. The action depends upon a power well known, viz. that of resolving water into its constituents, and effecting the reduction of the metals. The vessel and tubes being filled with a suspected fluid, rendered slightly sour by the addition of sulphuric acid, (so as to make it a better conductor of electricity) is to be connected with a galvanic battery of a few plates, by means of electrodes dipping into mercury cups, when decomposition will immediately commence, and if any arsenic be present, the metal arsenicum will be resolved at the negative electrode in combination with hydrogen, forming arsenuretted hydrogen gas, which rising will displace the water in the tube. As soon as the tube is full, the stop-cock is to be turned, and the gas inflamed as it

issues from the jet, when on holding a piece of porcelain or a watch glass over the flame, a metallic film will be deposited on it. That this is arsenicum is to be proved by the usual tests. A solution of one grain of arsenious acid in a gallon of water, or of one part in above 76,000, has by it been made to yield many metallic films, and it is possible that the division might have been carried much farther, and yet indications of the existence of the poisonous agent obtained. Inventors' Ad.

Improvements in Cutting Veneers.—This invention of improvements in cutting or sawing wood consists in the application of a peculiar construction of machinery, particularly applicable to cutting veneers or thin slices from a block of wood. The wood is fastened in a vertical position to an upright frame, which is moved up and down by a rack and pinion, and can be moved to or from the saw, in order to regulate the thickness of the veneer. The saw is worked as a circular plate, presenting a perfectly plane surface on its front side; but its back part is beveled or wedge-shaped, in order to throw off the veneer when cut, and there is a thin plate of metal placed behind the saw, to conduct the veneer away. The saw is placed in a sliding frame at the bottom of the wood to be cut, and a revolving motion is communicated to it; at the same time its frame advances, till the saw has passed through the wood; the frame then recedes with the saw, and the wood is lowered a distance equal to the depth of the cut; the saw then advances as before. Ib.

New Mode of serving Cables, &c. with Yarn.—This invention is an improvement in the serving mallet, and consists in so arranging the apparatus connected therewith, that a serving mallet constructed according to this plan will be rendered suitable for serving ropes or cables with yarn, and at the same time will carry a supply of yarn; thus dispensing with the necessity of a second person (heretofore required) to hand the yarn round the rope, during the use of a serving mallet of the ordinary construction. To the upper part of the serving mallet is attached a yarn-holder, which consists of a spherical vessel of copper. The upper part of it is capable of opening on a hinge, in order to admit a ball of yarn, and is retained when closed by a catch and wedge; the yarn passes out of the yarn-holder through an opening in its under part, thence under a friction crank on the side of the mallet, by means of which any required degree of resistance to the passage of the yarn may be obtained. The yarn is then passed once or twice round the serving mallet before serving the rope or cable. Ib.

Improvements in the Construction of Furnaces.—These improvements, the invention of Charles Wye Williams of Liverpool, consist, firstly, in the use and application of metallic pins as conductors for transmitting heat. This part of the invention consists in inserting metal pins in the plates of which the boilers, evaporating pans, &c. and pipes &c. attached to the same, are composed; part of each pin extending through the bottom of the vessel into the liquid to be heated or evaporated, and the other part projecting outside of the vessel into the fire beneath it, by which arrangement a greater quantity of heat is transmitted to the liquid than there would be by the usual method.

Secondly, in the mode of giving the longitudinal and vertical movements to the fire-bars of a furnace; also the extension of the fire-bars outside of the furnace, so as to receive fuel from a hopper, and spread it evenly over the fire-grate. The fire-bars are serrated (the elevated parts being wedge-shaped, and the depressions quite smooth) and incline downwards from the fire-door towards the bridge of the furnace, their lower ends resting on a bar, on which they are capable of moving vertically up and down as on a centre; the other ends terminate beneath a hopper outside of the fire-place, but within the fire-door; they are supported at this end by eccentrics placed on a horizontal shaft, which being turned by hand, or by gearing from the steam-engine, communicates the up-and-down movements to the fire-bars, and the fuel being received from the hopper on to the outer ends of the fire-bars, is urged with a gradually diminishing force towards their inner ends, and spread evenly over the surface of the fire-grate. By the continued movements of the fire-bars the generation of clinkers is prevented. *Ib.*

Transfer of Oil Paintings.—The historical painter Leipmann, the inventor of the plan of taking impressions of oil paintings, has received a pension from the King of Prussia of 500 thalers, on condition that he shall make known his secret, and give a description of all the experiments he has made. He is also required to give his assistance in perfecting the invention if desired.

On Promoting the Germination of Seeds.—Many plans have been recommended and adopted for assisting and insuring the growth of those seeds which are of difficult germination—such as keeping them in solutions of iodine, chlorine, &c. and happily with success. By certain chemical stimuli, the tardy and latent vital principle of seeds may be excited into action. We must not, however, confound and degrade the operation of the vital principle into mere chemical action; the chemical phenomena are developed as soon as the wonderful operations of this principle are observable. Of all chemical agents, perhaps, none exert a wider and more powerful influence than light; in the vegetable world its effects are manifest and important, the very color of plants and flowers being dependent on it; when it is withheld, color is lost, as in the familiar example of bleaching celery. I make these general observations respecting the great influence of light in vegetation, in order to bespeak attention to the contrivance I now recommend for promoting the germination of seeds—the application of the chemical stimulus of light. It is simply the placing a square of violet-colored glass over the top of the flower-pot in which the seeds are sown. It will be found that seeds exposed to the influence of this violet-colored light will vegetate more quickly than when covered with common stained glass, or with glass of any other color. The explanation is this: When a ray of light is transmitted through a prism, it is divided into seven component parts—red, orange, yellow, green, blue, indigo, and violet. Now it is proved by experiment that the violet-colored ray possesses by far the greatest power of producing chemical action; next to it the indigo, then blue, green, and so on up to the red ray, which possesses no chemically acting power whatever; on the contrary, the red ray has the greatest

heat-giving power, while the violet, the opposite end of the spectrum, exhibits scarcely any. As chemical stimuli are known to promote the germination of seeds, this of the violet-colored ray of light, as transmitted through a square of stained glass, will be found of the greatest possible efficacy. F. R. Horner.

Sir Humphrey Davy's First Apparatus.—The late Sir Humphrey Davy began his extraordinary discoveries in a very petty way; for while a youth, and the apprentice of an apothecary at the Land's End, he with a few gallipots, crucibles, and a retort or two, either in his garret or by the kitchen fire (when the cook could spare it) commenced a series of chemical experiments which in their result have immortalized his name; and to the science of agriculture he gave shape, and character, and light, which it never possessed before.

Bomb Balloons.—La Presse publishes a letter, signed "Vennelar, Ancient Captain of Artillery," which states that the writer had been present in a foreign capital at several experiments made with what he calls aërostatic percussion bomb-shells, which the inventor caused to explode in the following manner:—"A mass of trees of about two miles in circumference was marked out as the object to be attacked. Several stations were then fixed for the departure of the projectiles at two, four, and six miles distant from the point to be attacked. The inventor then, having attentively observed the direction of the wind, let off a pilot balloon sustaining a weight proportioned to its size. He then carefully counted the minutes which the balloon required to arrive at the point to be attacked. He then fixed a kind of spring to a moderate-sized balloon, which would let fall (according to the number of minutes indicated by the pilot balloon) a shell which caused frightful destruction to the first object with which it came in contact, and every spark from it caused all the combustible matter within its reach to ignite, without the possibility of being extinguished." La Presse publishes this letter for the purpose of proving the absurdity of fortifying Paris, as those balloons can be made to pass over the fortifications, and burn the city, without danger from the forts about to be erected.

New Indelible Ink.—M. Bezanger has sent to the French Academy of Sciences a description of a new economical ink, for which he has taken out a patent. It consists of lamp-black mixed with caustic soda, and gelatine and caustic soda. By adding an aromatic gum to this ink, it is difficult to distinguish it from Chinese ink, its qualities being the same, alkaline and indelible, but its cost much less. Moniteur Industriel.

Growth of the Bones of Animals.—At a recent sitting of the French Academy of Sciences, some interesting researches relative to the growth of the bones of animals, were announced. The reporter of the Academy's proceedings in the Journal des Debats thus notices the substance of the discoveries announced on this subject:

"We have already alluded to the experiments of M. Flourens, on the coloring of the bones of young animals that have been fed on madder, for the purpose of ascertaining in what manner the parts of the

skeleton grow, by observing the progress of the coloring as the madder penetrates them. It was indeed a fortunate suggestion which induced M. Flourens to resume the beautiful experiments of Duhamel, which remained incomplete, and to continue them with such perseverance. The manner in which the growth of bones takes place will be rendered perfectly evident by means of these new investigations, so carefully carried on. Thus, after having established the law which governs their growth in diameter, M. Flourens is now examining the manner in which they increase in length; and it is by means of the beautiful red tinge communicated to the bones by the madder, and which penetrates their various layers, that he determines the progress of ossification.

"By administering madder to young animals for a certain time, and by then discontinuing it, and again repeating this process, alternate layers of red and white are produced in the bones, which permit the progress of their growth to be traced, and enable us to ascertain whether it takes place from the interior to the exterior, or the reverse, and in what manner the elongation of the bones is effected. It is by this means that M. Flourens has discovered, what had not previously been attended to, that the bones grow towards the extremities by layers placed upon one another.

"Duhamel had previously endeavored to decide this question by an ingenious experiment, which consisted in piercing holes at equal distances in the bone of the foot of a young chicken. In the course of time this bone being elongated by the growth of the animal, Duhamel ascertained that the size of the space between the holes had not changed, while the distance from the last hole to the extremity of the bone was considerably increased; hence it resulted that the growth of the bone took place at the two ends, and not in the centre. The recent experiments of Flourens not only establish this as an undoubted fact, but they further prove how this growth takes place, by layers in juxtaposition.

"M. Flourens feels convinced that the substance of bones is continually renewed; so that at the expiration of a certain time, none of the particles are in existence that composed the bones some months before; which confirms that beautiful idea of Buffon, that the most durable part of matter is its form; its composition being never stationary, and changing, as it were, every instant.

"This truth has recently received further corroboration in the law of substitutions, which shows us heterogeneous molecules substituted for each other in chemical compounds, without the exterior form and character of these substances undergoing any change."

New Economical Lamp.—The *Fanal*, Brussels paper, mentions a lamp which has been recently invented by M. Pélabon, which gives as much light as three candles, may be very easily used, and burns only a centilitre of oil an hour. This lamp consists of a cylinder of copper or tin, in which a piston slides, which is lifted up every five hours, and in descending raises the oil to the burner. It is acted on by a spring, to which M. Pélabon has found the means of giving an equal force at all points of its action. This is effected by compensation, the oil being made to drop on the piston, and so increase by its weight the downward force as to produce an equivalent to what is lost by the spring in un-

bending. The cost of this lamp is stated to be about 30 francs. The *Fanal* says the burner is extremely small, but the light it affords is equal to that of three candles.

Influence of Pasturage on Wool.—It is well known to English wool collectors and manufacturers of cloth, that pasturage has a powerful influence on the nature and properties of the fleece. By way of example, we will suppose half a flock of Southdown sheep, reared in the centre of the South Downs, (known to be calcareous and chalky land) and the other moiety transferred to some of the rich land found in the neighborhood of Pevensey Levels, near Lewes. The contrast that would be perceptible in the fleeces of these two portions of the same flock, when shorn, is inconceivable to those who have not had an opportunity of witnessing the powerful influence of a change in pasture on the wool of sheep. Both the temperature of climate and herbage have an evident effect on wool, as may be seen in England on that of those flocks pastured within a few miles of the sea-coast, beginning with the Isle of Sheppy, &c. round the coast of Kent, Sussex, Hampshire, &c. The wool of flocks which are fed within ten miles of the sea-coast generally possesses a longer staple and more pliancy of texture, and consequently it is better adapted to the use of the spinner than the produce of the same flock pastured further in the interior on a similar soil. The difference is imputed to the exhalations arising from the sea, which, like the smoke of London, extend inland at least ten miles, thus operating on the herbage as well as on wool. An enlightened gentleman, well acquainted with the cotton plant in the United States, and with cotton wool in general, states that the sea air has the same influence on the cotton plant as on the wool of sheep. The sea island cotton is the strongest and the longest, and consequently best suited for spinning; and when the plant is removed from its favorite soil, and transferred to the interior, the wool becomes tender and of a different quality. It may also be added, that the change produces another species of cotton wool. Sussex Advertiser.

Improved Preparation of Silk.—The Courrier de Lyon gives an account of the application of carburetted hydrogen gas for facilitating the spinning of silk, and also for protecting the worms from injury previously to their being spun. The application that has been made by the engineer Gensoul, our countryman, of the heating power of steam on spinning the cocoons of silkworms, is well known. This engineer has, by the substitution of steam for the application of heat direct from the fire, as was previously used in the method of spinning silks, not only effected an entire revolution in this manufactory, regarded in an economical view, but has made very considerable advance in the art of spinning. Gensoul's process, by opening the way to a number of improvements in the art of spinning silk, each more important than the other, has brought to perfection the regularity and fineness of this valuable thread, which forms so important a branch of the trade, we may almost say of the prosperity, of our town. At present a new method is announced, which appears likely to supersede steam. In one of the last sittings of the Royal Society of Agriculture and Useful Arts, at

Lyons, a paper was read proposing the substitution of bi-carburetted hydrogen gas instead of steam, and to continue spinning day and night, so that the spinning factories, which according to the usual method are kept at work four months, and sometimes more, will finish the spinning of all the silk in from 50 to 60 days, which would apparently be attended with a considerable saving of expense from waste in the spinning, which increases in proportion to the length of time before it is completed. A great saving is also anticipated from fumigating the cocoons with the gas, as it will protect them from the moths and worms, and also from the attacks of vermin.

Portable Boats.—We noticed in a recent number the invention in France of a portable boat, covered with cloth, which could be readily shut up and carried, though it is capable of conveying several persons safely. We perceive in the Journal des Debats of Saturday last, the following account of a further trial of it on the Seine :

"An experiment was made last Sunday with the portable cloth boats of M. Leclerc, which was perfectly successful. This little flotilla was conducted from the gate of La Rapée to St. Cloud, without the least damage, and one man alone was sufficient to row the five boats, which carried 28 persons. During their progress the boats were brought to land several times, and in less than five minutes they were lifted out of the water, taken to pieces, put together again, and again launched. The advantages of this invention are numerous. In the first place, in warfare all rivers may be crossed by its means to reconnoitre, without leaving any trace of its passage ; all ships may have on board, without any incumbrance, twenty of these boats, always ready to effect an embarkation. As regards safety, and as a means of rescuing from drowning, a light boat of this kind, weighing only 12 or 15 kilogrammes, [about 30 lbs.] presents great facilities for being carried immediately to any point where succor is wanted ; and these boats would also be found desirable as pleasure boats, as they draw much less water than others, and are consequently more easily managed."

New Mode of Preparing and Engraving Cylinders.—The novelty of this invention consists principally in an application of the newly discovered process of precipitating, by galvanism or voltaic electricity, to the preparation of cylinders and rollers for printing or embossing calicoes or other fabrics. In order to form a cylinder, the inventor provides a shaft or mould of the diameter required, which may be either a conductor of electricity, and form part of the cylinder when it is finished, or it may be a non-conductor, and afterwards changed into a conductor, and removed from the cylinder when it is made. This shaft is immersed in a vessel containing a solution of a salt of copper, and is connected by a wire to the positive pole of a voltaic battery. A surface of metal, from which is to be formed the cylinder, is placed in the vessel touching the shaft, and this metal is connected by a wire to the negative pole of the battery, and the battery being put in action, the cylinder is formed. The inventor likewise erases portions of engraved plates or cylinders when required, by filling up those parts with metal. Those parts of the plates which are to be preserved are coated with

varnish, and the parts to be erased are first cleaned with water containing one-twentieth part of its bulk of nitric acid, and then coated with metal by the above described electric process. The cylinders, after being formed as first described, are filed smooth by means of a rotary file or cutter turned by suitable gearing. Inventors' Ad.

Improvements in Glass Working.—Glass of any size is placed in moulds made of fire clay, the interior surfaces of which are done over half with plaster of paris, and half with talc, which gives a very smooth surface; and the pieces of glass are arranged according to the disposition of the design it is wished to form, if any. These moulds are then placed in a muffle furnace, or oven, and the heat of it is gradually brought to the temperature requisite for a commencement of fusion, which is increased to a degree sufficient to solder together all the pieces of glass inclosed in the mould, so that they become one and the same piece. Above or over the moulds are placed funnels, made also of fire clay, into which glass is poured in a somewhat more fusible state, and which, in melting, fills the cavities that remain between the pieces of glass contained in the mould. The furnaces are permitted to grow gradually cool, after being hermetically closed, and they are opened only after a lapse of some time, calculated according to the size of the pieces contained; the object being to prevent any risk of breakage. The furnaces are constructed upon the same principle as those used by bakers, with the sole difference that these are heated by putting the fire beneath in place of within the furnace. To employ these methods or processes for the formation of blocks in imitation of marbles or precious stones, &c. the inventor operates in the following manner:—The glass, after being made in an ordinary glass-house furnace, containing metallic oxides, is placed in the moulds as herein before explained, and is made to undergo the oxidation appropriate to it. It then presents the colors desired, which are more or less opaque at will. All objects thus manufactured should be polished as looking-glasses are, which gives them the most beautiful effect. Ib.

New Steam-Engine Governor.—This improved governor is applied to the throttle valve of steam-engines, in place of the ordinary pendulum governor. The ordinary iron standard or frame of the governor is placed as usual over the crank shaft of the engine, on which is fastened a bevel wheel that drives a pinion attached to an upright spindle or shaft; by this means a rotary motion is communicated to the spindle, which revolves in suitable bearings in the frame. The upper part of this spindle is cut into a screw, on which a bush or nut having an internal screw works; this bush, having two arms extending from it, to each of which is attached a vane; and the bush is connected to the throttle valve of the engine by links and a swivel, and connecting rods and levers, in the usual manner. If the crank shaft overruns or increases its ordinary velocity, it will cause the bush to rise up the spindle, and by means of the connecting rods and levers, partially close the throttle valve; on the contrary, if the crank shaft decreases its ordinary velocity, the bush will descend, and so open the throttle valve wider, in order to admit an additional quantity of steam to the engine. Ib.

Purification of Rosins.—The method pursued in the forests of Bordeaux for extracting rosin is to make an incision in the bark of the pines, and the resinous fluid flows into a small reservoir placed at the roots of the tree. This rosin is mixed with splinters of wood, with insects, earth, &c. and it is therefore requisite before the rosin can be sold to purify it. To do this, it is boiled in uncovered boilers, and the hot liquid is poured upon filters made of straw, after passing through which, it is put into a still to extract the essence of turpentine. The straw filter is renewed at every operatian, and contains more or less resinous matter, which is converted into dry rosin, and thus loses a part of its value, as the boiling of the liquid rosin in the open boilers causes it to lose a portion of its volatile essence. M. le Comte de Lambel has made several attempts to improve the process, and to remove the difficulties and inconveniences attending it. The straw filter, besides the inconvenience of retaining part of the resinous fluid, is also objectionable on account of its yielding only an opaque and consequently impure residuum; he therefore endeavored to substitute for it some other kind of filter, which might be heated to the temperature of the melted rosin, so as to allow it to run through without the necessity of renewing the filter, and that might be used without the necessity of losing any of the rosin. To effect this object, he employed a filter composed of coarse grains of sand. This filter may also be advantageously used for the purification of syrups.

Through this filter the rosin passes pure and transparent, after placing upon it a wire sieve of suitable coarseness, for the purpose of straining out the grosser impurities. The filter, when cold, can be entirely deprived of the resin it retains, and thus the principal object to be desired has been attained. When the filter was placed in a stove, the heat of which could be gradually increased, different qualities of pure and transparent rosins could be obtained. When a still-head was placed on the top of the stove, and hermetically sealed, the essence which escapes in the open boilers could be collected. The stove, set in masonry, can be placed without inconvenience at a little distance from the distilling apparatus: it might even, by means of a stopcock exactly ground, allow the liquid purified rosin to flow, without any trouble or cost of carrying, into that apparatus. It has been found also, that the rosin which crystalizes at certain periods of the year on the trunks of the trees, and on the incisions that have been made in them, might be dissolved in the essence of turpentine, and purified with advantage, should the increased value of this product pay for the expense of a second distillation. Inventor's Ad.

New Method of Perforating Glass.—Put a drop of spirit of turpentine on the spot where the hole is to be made, and in the middle of this drop a small piece of camphor. The hole can be then made without difficulty, by means of a well tempered borer, or triangular file. Solid turpentine answers as well as the spirit and camphor. Annales des Mines.

Electrical Clock.—A German artist, now in London, is about to take out a patent for the invention of a clock worked by electricity. The machine, which is remarkable chiefly for its extreme simplicity, is com-

posed only of a pendulum, one large wheel, two escapements, and a quadrature. Such are the visible parts. We must suppose, however, that a pinion and a wheel form the communication between this great wheel and the quadrature, though these are not to be seen. The pendulum at each vibration causes one of the escapements to advance the great wheel one tooth, which after this movement has a pause, making the dead second. As there is no metallic moving power to set the machine going, we find on examining what keeps up the motion—that the pendulum (which is almost out of proportion with the clock) descends into a case, and there at each vibration the ball or body, which is furnished with a conductor, approaches alternately two poles, to which voltaic piles supply their portion of electricity, so that the pendulum when once put in motion retains it by means of the electricity alternately drawn from the two poles. There can be no doubt that other interesting results may be obtained by employing the electrical fluid as a motive power, however slight the power which such an agent may seem capable of communicating. Morning Post.

Sulphur.—M. Regnault has noticed a curious fact relative to sulphur when solidifying, after it has been previously reduced to the state of a paste. It is known that sulphur, when kept in fusion for a certain time, changes its color, becomes of a hyacinth red, and acquires the property of remaining soft for a long time, by plunging it into cold water. M. Regnault has observed that sulphur in this state, when submitted to a temperature of about 98° (centigrade) in a stove, liberates a great quantity of heat in becoming solid, so as to raise the thermometer suddenly to 110°. When the solidification is effected, the thermometer returns to the temperature of the stove, and there continues. Mech. Mag.

Liquefaction of Air.—M. Tillorier (the French chemist, in whose lecture room at Paris a recent explosion of carbonic acid gas took place, which killed M. Hervy, a very promising student) has undertaken the dangerous experiment of attempting to liquefy atmospheric air by pressure. The apparatus for this purpose has been nearly completed. To effect the liquefaction of air, he contemplates compressing it more than 2400 atmospheres, instead of 100, to which extent he carried his compression of carbonic acid gas. Ib.

Improvements in Chronometers.—These improvements relate to the construction of clocks and chronometers with two main springs, in conjunction with a constant power or regulator, so that they will go for a longer period than usual without winding up. The constant power or regulator is a wheel of 80 teeth, inside of which there is a barrel with serrated edges having a spring and catch, and kept by two holding pieces. When this "constant power" is applied to a clock, the wheel works into the pinion of the escapement. By varying the size of the wheel, the length of time that the clock will go will also be varied.

Among other advantages claimed for this mode of construction is this: that should either of the main springs break, the other will be sufficient to keep the chronometer, &c. going; but as only one half of the power would be exerted, it would be necessary to wind it up twice

in the time it would have gone had both barrels continued in action. Another advantage is, that the spring not being connected directly with the escapement, a common spring may be employed for the purpose. Ib.

Destructive Action of Sea Water.—At a recent meeting of the Royal Institution, Prof. Daniells delivered a lecture "On the Spontaneous Evolution of Sulphuretted Hydrogen in the Waters of the Western Coast of Africa and elsewhere." Owing to the destruction of the copper sheathing of vessels in a short space of time, when stationed on the African coast, the Lords Commissioners of the Admiralty have had specimens of water from different parts of the African shores carefully brought to this country to be analyzed, in order, if possible, to arrive at the cause of this destruction, which usually takes about nine months to effect. Mr. Daniells has clearly ascertained and proved that it depends on the presence in the water of sulphuretted hydrogen gas, which occurs in these regions to an almost incredible extent. He also considers that the occurrence of this gas in large quantities in those climates is the cause of the malaria which in such situations is so prevalent; and that it is produced by the accumulation and decomposition of vegetable matter in combination with the *sulphates* of the different salts met with in sea-water. The same explanation also, in his opinion, will account for the unhealthy character of many parts of our own coasts, which might and even has been on the continent prevented, by shutting out the sea-water from the marsh land, and arresting in this way the evolution of so deleterious a gas in such situations, The vessels fitted out for the Niger expedition have had every attention paid to them for the removal of malaria, &c. by the requisite ventilation, and other means which the progress of science has on principle suggested. Polytechnic Jour.

Kidderminster Carpeting.—An improvement in the mode of manufacturing this article has recently been patented in England. The yarn or weft is dried and scoured in the usual manner, when dry it is wound on bobbins, and reeled on an ordinary traversing reel. The skein is then arranged on dyeing poles, and the one half immersed in any required color; when this portion is dyed, the other half is dyed of some other color, so that the yarn or weft is of two different colors in its width. It is then mounted in a loom in the ordinary way, and woven, when, in consequence of the former process, the face of the carpet will exhibit the figured or ground color changed alternately at pleasure, giving the appearance of a drop pattern, as is sometimes done in Brussels carpets. Mech. Mag.

Tempering Steel.—Mr. Oldham, printing engineer of the Bank of England, who has had great experience in the treatment of steel for dies and mills, says that for hardening it the fire should never be heated above the redness of sealing wax, and kept at that pitch for a sufficient time. On taking it out, he hardens it by plunging it, not in water, but in olive oil, or rather naphtha, previously heated to 200° F. It is kept immersed only till the ebullition ceases, and then instantly transferred into cold spring water, and kept there till quite cold. By this treatment the tools come out perfectly clean, and as hard as it is possible to make

cast steel; while they are perfectly free from cracks, flaws, or twist. Large tools are readily brought down in temper, by being suspended in the red-hot muffle till they show a straw color; but for small tools he prefers plunging them in the oil heated to 400°, and leaves them in till they become cold. Mr. Oldham softens his dies by exposing them to ignition for the requisite time, imbedded in a mixture of chalk and charcoal. Dr. Ure.

Cables.—The length of each yarn for a cable of 120 fathoms is 1080 feet. It loses about a third of its length in the subsequent operations of twisting the strands and uniting them, so as to form a cable. Some of the largest cables contain nearly seven tons of hemp, and the united strength of eighty men is required to join the strands and twist them closely together. Mech. and Chemist.

New Motive Power.—Mr. Fox Talbot has taken out a patent for improvements in producing or obtaining motive power, of which the following description is copied from the Mechanics' Magazine:

A strong metallic vessel is provided, of the "black-bottle" shape, the part corresponding to the neck of the bottle being a cylinder fitted with a piston, and the ordinary appendages for communicating motion to a crank shaft in the usual manner. This vessel is filled about half way up with water, or with water slightly acidulated to facilitate its decomposition. A pair of wires enter that part of the vessel which is occupied by the fluid, on opposite sides, and terminate in two metal plates a short distance apart. These wires are to be properly insulated at their insertion into the containing vessel. Above the part occupied by the fluid there is another pair of wires, connected together by a very fine wire of platinum. The upper and lower pair of wires are alternately connected with and disconnected from the positive and negative poles of a galvanic battery; the ends of the wires terminate in springs, which press upon the circumference of a revolving metal shaft, upon which a fly-wheel is mounted; part of the metal is removed from the circumference in places, and filled up with wood, bone, or other non-conducting medium, so that the springs continually pressing upon the revolving surface are alternately in and out of connection with the battery. By means of this arrangement, an electric current is first passed through the lowest pair of wires, which being spread over the extended surfaces of the two plates, decomposes the water, oxygen being evolved from the one plate, and hydrogen from the other; this connection is then, by the revolution of the shaft, broken, and the current passed through the upper pair of wires, when the platinum wire becomes red-hot, and inflames the gases. The evolution of the gases causes an upward, and the explosion produces a downward motion of the piston.

A second arrangement for producing power is described as follows: A large soft iron horseshoe, surrounded with helical wires, is placed perpendicularly in a square case or frame, to the top of which a long lever is jointed; at a short distance from this fulcrum an armature is attached. At the other end of the lever there is a small hole through which passes a connecting rod from the crank shaft of a fly-wheel; this rod terminates in a knob or stop, so that as the crank approaches the

upper part of its circuit, the lever and armature are raised; but as the armature has but a very limited range of motion, as the crank descends the armature rests upon the horseshoe, and the connecting rod continues its progress, passing freely downwards through the hole in the lever. Two wires proceed from the helix to the opposite poles of a battery, the connection with which is made and broken by a revolving shaft, as before. On the connection being made, and the crank being in its highest position, the horseshoe becomes magnetic, and strongly attracts the armature, which brings down the lever, crank, &c.; as soon as the armature is in contact with the magnet it stops, but the crank continues its motion, and the electric current is broken, leaving the armature free to be raised by the impetus originally communicated to the fly-wheel. In the same way a succession of magnets and armatures may be so arranged as to act one after the other, and constitute a continuous force throughout the whole downward motion of the crank.

Another mode of producing power set forth, consists of an inverted syphon, the left leg of which is cylindrical and fitted with a piston; the lower part of the syphon is filled with oil, water, mercury, or other dense fluid; the upper part of the right leg is filled with carbonic acid or other gas. By means of suitable wires, an electric current is capable of being passed through this fluid, by which it is heated, and, expanding, raises the piston. As the piston reaching the top of its stroke the electric current is broken, and the gas contracting to its original limit, permits the piston to descend, when it is again raised by the same means as before.

Composition for Roofs.—The following composition was employed for the roof of a mill at Wickham, Hants, twenty years ago, and is now as good as ever; the roof is flat, having a run of one inch to the foot from the centre, of thin boards, to which was nailed one course of common sheathing paper:—To eight gallons of common tar was added three gallons of roman cement, five pounds of resin, and three pounds of tallow; these ingredients were boiled and well stirred, so as thoroughly to incorporate them, and payed on to the roof hot with a brush, spreading it as evenly as possible. Before it got cold it was sprinkled with sifted sand. When the first coat was cold, a second was applied, and sanded as before. A single coat of common or coal tar, about once in five or six years, is sufficient to preserve it indefinitely. Mec. Mag.

New Musical Instrument.—This invention consists of a musical instrument, resembling a guitar in shape, capable of giving out separately or in combination, the tones of a violin, clarionet, and violincello. These tones are produced by means of a double bellows, the wind from which acts upon a number of keys which are moved by the performer passing his fingers over a series of buttons on the handle of the instrument, which are connected with the keys by cords or wires. The keys are a kind of boxes having an opening at the bottom for the admission of air, and provided with a vibrating tongue or valve at the top, which is attached by an elbow lever to one of the cords or wires. When the performer depresses a button, the cord acting on the elbow lever opens the valve, the air passing through which produces the musical sound. Ib.

History of the Literary Fund Society.—It appears from letters and papers yet preserved, that so early as 1773, the Rev. David Williams proposed the formation of the Literary Fund to a small select club of literary men, who met at the Prince of Wales tavern in Conduit-street. The chairman on this occasion was the celebrated Benjamin Franklin, who, in discussing the merits of Mr. Williams's proposal, expressed great regret in declaring his opinion, that a fund of any considerable amount, for a purpose he acknowledged to be truly noble, could not be obtained, because the impression to be made by an appeal to the public must be very feeble. "Common charities," he said, "spring from common feelings; or if some of them should require a few ideas and reflections, they may be easily connected by ordinary and imperfect intellects; but an institution for the relief of misery, which is so far from being intrusive and obvious—so far from pressing on the senses that it withdraws from observation—is an institution whose object will be ever lost to the common classes of subscribers to public charities." The object, however, appeared to all the members of the club to be so important, that the further consideration of the question was adjourned, and the meeting was dissolved by Franklin in a few words, which, however, bring him vividly before the reader. "I perceive," said he, "that our friend does not acquiesce in our opinions, and that he will undertake this institution. The event, be it what it may, will be honorable to him; but it will require so much time, perseverance and patience that the anvil may wear out the hammer."

Subsequently Mr. Williams applied to Pitt, Fox, Burke, and others, in the hope of obtaining their aid; but he observes, in letters still extant, "it was treated as a fine speculation, impossible to be realized." The subject now slumbered for a while; but in 1788 an accidental and distressing circumstance revived it, and many who were acquainted with Mr. Williams's exertions regretted that they had not been successful. It was in that year that Floyer Sydenham, an amiable man, and a laborious but unpatronized scholar, who had acquired considerable reputation by translations of the works of Plato, died in consequence of his arrest for a small sum due to a victualer, who had supplied him with his frugal meals. Sydenham never spoke after his arrest. After some consideration of the difficulties he had experienced in obtaining the sanction of great names, Mr. Williams now determined to have recourse to an anonymous advertisement, and to make his first appeal, not to the justice and gratitude of the public, but to the humanity of individuals. At the next meeting of the club, *eight guineas* were subscribed to defray the insertion of an advertisement; but the result was merely sufficient to pay its own expenses, and to print the constitutions of the proposed society. Mr. Williams, however, resolved to call a public meeting on the subject: that meeting was held on the 18th of May, 1790; and on that day the Literary Fund was established.

Towards the end of the year the Society had increased sufficiently to pay its current expenses, and enable the committee to dispense its bounty. Only two applications were made to them during this year: the first was from an officer in the army, who had published two small works; but the committee determined that such authorship was insufficient to give him a claim upon the Literary Fund, and refused the peti-

tion. The second case was one of far higher pretensions, an author of considerable reputation, whose historical works are still esteemed: to him the committee awarded several benefactions, which were liberal according to the extent of their means. * * * * The Permanent Fund was commenced in 1797, and in the following year the treasurers were enabled to make their first purchase of stock. By extreme good management, the Society during the first ten years of its existence, even with its limited resources, bestowed £1179 in the relief of applicants, and purchased stock to the amount of £1000.

In 1803 the largest subscription ever contributed to the Fund, £474, 19*s.* 6*d.*, was collected at Hyderabad, by Col. Kirkpatrick, and transmitted to the Society. In 1805 the Prince of Wales became its patron, and ever after a liberal benefactor. An event of great interest in the history of the Society is the legacy of Thomas Newton, the last representative of the great philosopher. At the age of 86, he exclaimed with enthusiasm, on reading the Reports of the Society, "This is the institution for the representative of Newton;" and he bequeathed to it his small estate. In 1818 the Society received a charter of incorporation; but Mr. Williams did not live to see the accomplishment of this object of his wishes, though long enough to see his benevolent exertions crowned with success.

Many of our readers will be surprised to hear that, in its brief and noiseless career, the Literary Fund has already distributed more than £26,000. Well may the committee express a hope that "an institution diffusing such substantial good, and dispensing its benefits with equal delicacy and promptitude, must carry with it its own recommendation, and plead more powerfully than they can in its own behalf. * * * How much misery this bounty may have lightened or extinguished; how many sinking spirits it may have cheered to new exertions; how many years of helpless decay it has blessed with comparative comfort; how often it has smoothed the pillow of sickness or of death; and what agonies of mind it has healed among a class of men whom the habits of their whole lives, their education and intelligence render most vulnerable in the mind—must be beyond human record; but they will not be forgotten where it is most important that they should be remembered.

Atheneum.

Balloons.—An experiment of the highest interest has been performed at the Chateau de Villetaneuse, near St. Denis. M. S. and his son had for sometime past announced publicly that they had succeeded in the means of directing balloons in the air, and several experiments on a small scale, in the court-yard of the Ecole Militaire, in Paris, had been attended with satisfactory results. The experiment of Monday has verified all their hopes. M. S. jun. after rising to a height of about 250 metres with a balloon constructed by himself and his father, set at work their ingenious mechanism, and immediately the balloon proceeded to the west, notwithstanding a pretty strong wind blowing from that point. He then returned, and sailed about in various directions, the balloon rising or lowering at the will of the aëronaut, without the apparent use of any kind of ballast. The experiments lasted for three hours, at the expiration of which time M. S. descended at the point from which he had started, amidst the acclamations of the spectators. Moniteur Parisien.

The Arts at Munich.—Professor Julius Schnorr, of Leipsic, is another of the bright galaxy of French painters now at Munich. His sketches from Ariosto, in the villa Massini at Rome, first brought him into notice. He was invited hither by the King, and commissioned to adorn certain rooms in the palace with the story of the "Nibelungenlied." The natural romance of his disposition, the passionate warmth and peculiar fancifulness which he imparts to his productions, attributes so characteristic of the poetry of the middle ages, especially qualified him for the task imposed on him. While still in the land of romance, however, and ere he had fully depicted the astounding feats of Huon, the dwarfish guard of the Nibelung treasure, the loves of Chriemhilda and Siegfried, and the deeds of the other no less celebrated personages in that singular poem, he was summoned away to another field. A still newer palace had been erected by the King: this is a noble building, after the plans of the Chevalier Klenze, 800 feet in length, and destined for high festivals and the reception of distinguished guests. It was here that Schnorr was called upon to display his talents, in a series of historical paintings from the lives of Charlemagne, Frederick Barbarossa, and Rodolph of Habsburg. Before proceeding further, I must say a word on the method in which these paintings are executed; as they are not *al fresco*, but in a lately discovered kind of encaustic, called wax painting. The architect Leo von Klenze, who is also a painter, and others, had long been racking their brains to effect an improvement in this kind of painting. But all their efforts proved more or less abortive. The colors did not stand, and after a time peeled off. Meantime another artist, named Fernbach, is said by his own unaided exertions to have effected what those united had failed to do. The King's attention was drawn to his discovery, and he bought the secret of him. The process is somewhat as follows:—the wall is first rubbed with pumice; a certain preparation, principally of wax I believe, is then smeared on it, and by the application of heat melted into the mortar, which is also prepared in a peculiar manner. Upon this coating the artist can lay on his colors, which Fernbach himself mixes. When the painting is finished, heat is again applied, which has the effect of bringing out the colors. One principal advantage of this new method is that some colors not available in fresco can here be brought into play, and thus greater richness of tint, in which fresco has always been deficient, can be given. Another advantage is, that the artist can commence and leave off painting wherever he thinks fit, which is by no means the case in fresco. In the latter, all artists know, it is necessary to scrape off the mortar to the depth of nearly an inch, and fresh mortar is laid on in its place, on which the painter can only work so long as it remains moist, i. e. about eight hours in winter, and five in summer. Hence he can paint only a patch at a time, and before he resumes his brush it is necessary to scrape the mortar sharply away from the edges of his previous work, where fresh mortar is laid on as before. Now as it is inconceivably difficult to match the tints in the old and new piece exactly, he is forced to finish at one spell a limb or a garment—anything, in short, all of one color; or failing in this, he leaves off at a part where the shade is deep, that the difference of tint, where he begins again, may not be so perceptible. I found the new kind of painting, though

lighter than oils, less so than fresco, the reason of which appears to be, that the crystalline particles of the mortar reflect, while the oleaginous mixture smeared over the wall in the new method has the effect of absorbing the rays. * * * * * * * * *

I went to the institution where the glass is painted for the new church in process of erection, dedicated to St. Bonifacius, the Scotchman who first converted Germany to Christianity, and where I was to meet by appointment M. Hess and M. Ainmüller, who superintend the technical part. These gentlemen most obligingly conducted me over the establishment, and explained everything connected with the process. The glass is first stained near Munich. I saw as many as 120 varieties of colors and shades; amongst others the difficult flesh tint, which M. Ainmüller has succeeded in exactly imitating. The difficulty and risk attending the painting is scarcely conceivable, which is the reason of the comparative expensiveness. After painting on the stained glass, it is placed in a furnace, and subjected to a powerful heat. It is allowed to cool very gradually; and this operation of painting and baking is repeated three successive times. To lessen the risk, only small pieces are employed, as less liable to split than larger ones; but, as if to show what can be done in this art, they have painted on one single pane of glass, of perhaps two feet square, a copy of the Guido in the Munich Gallery, 'The Ascension of the Virgin,' which returned happily thrice unscathed from the fiery ordeal, and stands a beautiful monument of ingenuity and perseverance. Cor. of Atheneum.

New application of Papier Mâché.—The Society of Arts, at their meeting on Wednesday last, voted their gold Isis medal to Mr. Simpson, surgeon to the Westminster General Dispensary, for the application of *papier mâché* to the making of anatomical figures and models of morbid anatomy. "Mr. Simpson (says a correspondent) some years ago turned his attention to the constructing of anatomical models, in consequence of the difficulty and expense at that time attendant on procuring subjects for dissection. The materials in general use at that time for anatomical models were wax or plaster, of which the former was found to be too expensive to come within the means of lecturers and students in general, and was too delicate to be handled in the lecture room without incurring the chance of considerable damage. The plaster-of-paris models were also objectionable on account of their weight and brittleness. The material which he uses is paper worked into moulds taken from dissections. This produces a model of extreme lightness, and so hard that it may be freely handled without danger of damage. The external surface is painted in oil color representing the appearance of the dissection. Mr. Simpson conceived that his invention would be particularly serviceable for the study of anatomy in warm climates, where wax models cannot be used, nor the natural subject be conveniently dissected, and submitted some specimens to the East India Company, who sometime since purchased 40 of his figures, which were sent to various settlements in India for the use of European surgeons, as also for the instruction of the native surgeons, who were assistants in the Company's military hospitals, their religion prohibiting them from studying from dissections. They have also been purchased by her Majesty's Navy Medical Board, &c. Ib.

DESCRIPTION OF AMERICAN PATENTS

Granted from April 2d to May 4th, 1841.

Improvements in the machine for cutting Staves. By Cephas Manning, Acton, Mass. April 10th.

Claim.—I claim the arrangement of the holders of the cutters for forming the bevel and groove, and for cutting off the ends of the staves on curved or straight bars GG, or similar contrivances, so that they may be adjusted to cut staves of different lengths, and preserve the bilge of the stave, as herein described. I claim also the combination of machinery by which the pawl S may be thrown out of gear, with the ratchet wheel, said combination consisting of the upright bar *p q r*, lever *s t u*, spring *w*, catch *v l m*, and bar *l q*; the whole being arranged and operating substantially as herein above set forth.

Improvement in Lamps. By Benjamin F. Greenough, Boston, Mass. April 10th.

Claim.—1. The placing of a shoulder on the rod by which the button is supported, said shoulder being so constructed as to set loosely on said rod, and adapting the button to a projection on said shoulder in a similar manner, by means of which combined arrangement the rapid oxidation of the disk is prevented, all as herein set forth.

2. Guiding the adjusting rod of the button, by passing the same through a hole whose lower end is attached to the bottom of the oil cup, or otherwise similarly arranged, the said tube extending upwards into and through the central part of the interior tube of the burner, the whole being for the purpose of permitting an uninterrupted current of air to act on the inner surface of the flame, as above set forth.

3. The combination of an adjusting cone, (applied to the exterior tube of the burner by a circular spring or other contrivance substantially the same, by which its altitude can be regulated) with the adjusting button, or one whose elevation may be varied at pleasure, the whole being arranged substantially in manner and for the purpose above mentioned.

I claim a cone, constructed with an extended cylindrical base, having a series of radial holes through the circumference of the same, and made so as to be adjusted in height on the exterior tube of the burner by means of a circular shelf and spring, in combination with a movable button, whose rod is supported and guided by a tube connected with the oil cup, and whose elevation can be regulated by a screw or other suitable contrivance; the whole being constructed and arranged substantially in manner and for the purpose of supplying the flame with an uninterrupted circular current of air on each side thereof, as above set forth.

Improvement in Agricultural Machines for Tilling and Planting at the same operation, called the Cylindrical Tiller and Planter. By John F. Schermerhorn of Carroll county, Ind. and Rufus Porter, New York. April 10th.

Claim.—What we claim as our invention, and wish to secure by letters patent, is, combining the large or cutting cylinder A, and the revolving shaft of spiders I, arranged as set forth, in an open frame, so

constructed as to allow of their application to the purpose specified, as herein described.

We also claim, in combination with the foregoing, the hoppers L, and planting cylinders J, the whole being constructed substantially as described.

Lastly, we claim in combination with the cylinder A, and shaft of spiders I, arranged as set forth, the mode of raising the frame and cylinders from the ground by means of the shoes O, and levers Q; the whole being combined, arranged and operating substantially in the manner described.

Improvement in Abdominal Supporters or Trusses for Prolapsus Uteri. By John A. Campbell, Lima, Livingston county, N. Y. April 10th.

Claim.—I do not claim as my invention either the abdominal or the back pad, neither do I claim the body spring; but what I do claim as my invention, and desire to secure by letters patent, is the arrangement of the spring D, and the spring adjuster E, in combination with the abdominal pad, body spring and back pad, for the purpose of regulating the pressure of the abdominal pad, constructed and operating as herein described.

Improvement in the manner of constructing Window-Blind Fasteners. By Sylvanus Fansher, Southbury, Ct. April 10th. [Antedated December 10th, 1840.]

Claim.—What I claim as my invention, and desire to secure by letters patent, is the above described mode of fastening window shutters and blinds, which consists of the bar attached by a joint to the shutter, in combination with the staples *(ee)* and *(dd)* so that the loop on the end of the bar shall pass over the staples *dd*, to keep the shutter closed, and over the staple *e*, to keep it opened, all as herein described.

Improvement in the manner of Casting Hinges on to their Axes. By Samuel Wilkes, Darleston, Stafford county, England. April 10th. [Antedated 21st January, 1840, the date of English patent.]

Claim.—What I claim is the mode of manufacturing hinges by casting the two flaps or sides with their hinge joints at one time, on to a suitable axis, as above described.

Improvement in Cooking Stoves. By M. C. Sadler, Brockport, N. Y. April 10th.

Claim.—I do hereby declare that I do not claim to be the first to have constructed a cooking stove with two fireplaces or chambers of combustion, in either or both of which fires might be made, this having before been done, but not under an arrangement and combination of parts similar to that adopted by me; but what I do claim in the above described stove, and desire to secure by letters patent, is the manner of constructing and of placing the cold-air flue between the chambers of combustion and the ovens situated above and between said fire chambers, as herein set forth.

I claim likewise the making of the valve seats hollow, and the ad-

mitting of air into them, in the manner and for the purpose described; and also the protecting of the dampers, by constituting the spaces formed by them when opened into cold-air flues, in the manner set forth.

I also claim the manner of arranging the oven flues, as described; that is to say, the dividing the bottom flue-plates into two parts, so as to cause the heated air to enter the flues along the middles of the bottom oven plates, and to ascend on each side of the ovens, as herein fully made known; the whole being constructed and arranged substantially as described.

Improvement in the Machinery for Pressing Braid after it has been Trimmed. By HENRY H. ROBBINS, Middleborough, Mass. April 10th.

CLAIM.—I shall claim as my invention, pressing straw braid by means of a polished revolving metallic wheel or roller, in combination with a hollow metallic box, the upper side or face of which is concave and polished, and which is heated by the introduction of steam, as above described, the concave face being pressed against the periphery of the wheel by means of a bent lever and weight; the whole being arranged and operating substantially as herein above specified.

Improvement in the form of the Screw-Propeller for Propelling Vessels. By EBENEZER BEARD, New Sharon, Franklin county, Me. April 10th.

CLAIM.—I shall claim curving the wings of the screw paddles or propellers in a direction perpendicular to the shaft of their axis of revolution, substantially in the manner and for the purpose above set forth.

Improvement in Machines for planting Corn and other Seed. By EZRA L. MILLER, Brooklyn, N. Y. April 10th.

CLAIM.—What I claim as constituting my invention, and desire to secure by letters patent, is, first, the manner in which I have combined the reciprocating slide K, the stop M, the cams on the wheels, and the spring or springs by which the slides are operated; by means of which combination an alternately slow and rapid motion is given to the reciprocating slides, by the sudden arresting of which against the stop a concussion is produced when the seed vessel is directly over the dropping tube, which insures its falling. I also claim the particular construction of the spring strike, formed of elastic quills, and affixed and operating substantially in the manner and for the purpose set forth. I also claim the manner of constructing and operating the agitator, as herein described.

Improvement in the mode of hardening manufactures of Cement, and rendering them impervious to moisture. By SAMUEL GOODWIN, New-York. April 16th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the mode of rendering articles manufactured from cement, compounded of the materials above specified, or any other substantially the same in their composition, impervious to air, moisture,

or decay, by boiling them in a mixture of oil and rosin, as above described.

Improvement in the mode of ascertaining the pressure of Steam in the Boilers of Steam-Engines. By George Bradley, Paterson, N. J. April 16th.

Claim.—I do not claim as my invention any part or parcel of the spring balance represented in the drawing; what I claim as my invention, and not previously known nor used, is an oscillating piston to which is attached a metallic spring, in such a manner as to counterbalance any pressure that may be communicated from the steam-boiler to such piston, and at the same time show what that pressure is by means of an index.

Improvement in Cooking Stoves. By John B. Bissell, Oaksville, Otsego county, N. Y. April 16th.

Claim.—I do not claim the invention of the raised collars or rolling or slide damper, or either of the fire-chambers, they severally having been used before in different stoves; but I do claim as my invention and improvement, the method of arranging and combining the upper and lower fire-chamber with each other, and with the flues around the oven, by means of flues governed by dampers G and K.

Improvements in the manner of arranging and operating the Dogs of Sawmills, as originally constructed and described by Hezekiah Thumber in the specification of letters patent granted to him on the 30th of May, in the year 1838. By Damon A. Church, Friendship, N. Y. April 16th.

Claim.—What I claim as new in the last described parts of my apparatus, is the manner in which I have arranged and combined the parts on the tail block, for withdrawing the dog *n*, after a board or plank has been cut, so as to allow and cause it to fall over; that is to say, I claim the apparatus, consisting of the shaft *p* and its appendages, by which it is made to draw the dog *n* back, and to act upon the spring piece *w*, the said parts being arranged substantially in the manner set forth. I also claim the manner of withdrawing and replacing the dog *f'* on the headblock, by means of the jointed rod, rock shaft and tripping piece, arranged, combined and operating substantially as set forth.

Method of manufacturing Handles for Knives and other Table Cutlery. By Zina K. Murdock, Meriden, Ct. April 16th.

Claim.—What I claim as my invention, and desire to secure by letters patent, is the mode or method of constructing handles for table cutlery from plates of ivory or bone, &c. combined substantially in the manner specified above.

Improvements in Machinery for Drying, Whipping, and Cleaning Feathers. By Nathaniel L. Manning, Boston, Mass. April 16th.

Claim.—Having thus described my improvements, I shall claim the mode herein before described of drying and cleansing the feathers by

means of carbonic acid gas, hot air, and other products of the combustion of charcoal or other suitable fuel, introduced among the feathers during the process of whipping and separating them from each other, substantially in the manner as before set forth.

2. I claim whipping and separating the feathers from each other by means of bows and sails applied to a revolving shaft, which shaft shall remain in one position while revolving, and the feathers be brought under the action of the same in the box in which said shaft revolves in any convenient manner, or said shaft may be moved over the mass of feathers, and back and forth throughout the box, by means of a band and pulley, or a chain belt and cogged pinion, operated as above described.

3. I claim closing the elongated slots or apertures in the sides of the box, so that none of the feathers may escape or impede the operations of the machinery, as the revolving shaft is moved to and fro, by means of the band laying over the same, and traveling over drums or pulleys, and operated by the revolving shaft, as herein before set forth.

Improvement in the method of constructing Screw Wrenches. By Loring Coes, Springfield, Mass. April 16th.

Claim.—Having thus described my invention, I shall claim combining the screw which operates the sliding jaw, (and which is placed on one side of the shank, upon which the said jaw moves, and to the extremity of which the hammer jaw is applied) with a female screw, formed through a projection from the sliding jaw, situated on the same side of the shank with the adjusting screw; the said adjusting screw to be suitably supported, and to have a turning or milled nut placed thereon, a portion of whose edge or periphery shall pass into a notch or other similar contrivance formed in or upon the side of the shank of the wrench, so that the said adjusting screw may be always kept in the same position, and when revolved cause the lower jaw to slide on the shank; the whole being arranged and operating substantially as herein before set forth.

Improvement in Pumps. By Jesse Reed, Marshfield, Mass. April 16th.

Claim.—Having thus described my improvements in pumps, I shall claim—

1. The method of confining the lower valve to its seat, so that it may be easily removed therefrom for repair or other purpose, by means of a spring to which the valve is connected, and which rests on the upper surface of the bottom of the pump barrel, its ends pressing against the interior circumference of the barrel, the same being arranged and constructed substantially as herein before described.

2. I claim the particular mode, above described, of constructing a pump with an air-chamber below the lower box, into the bottom of which chamber the pipe communicating with the cistern or well is inserted or connected in any proper manner, and through which chamber another pipe passes, the lower end of which is situated immediately over the top of the induction pipe, while the upper end is joined or

connected to the top of the chamber, the said pipe communicating at top with the pump barrel, (the lower valve of the same being immediately over and upon its ends) and at bottom (by any sufficient number of holes or orifices bored through the same) with the said chamber through which it passes, the whole being arranged substantially as above described, and for the purpose of permitting the water from the cistern or well to rise into the chamber during the downward stroke of the piston or upper box, and otherwise operating in manner as herein before explained and set forth; meaning in the above not to claim the addition of an air-chamber to the lifting pump, but my particular mode of constructing and applying the same as above described.

3. I claim the method of adjusting the pump-handle or lever which raises and depresses the upper box, by attaching said lever to the top plate or cover of the pump barrel, and arranging said plate or cover, as before described, so that it may be turned around and fixed in a position by a screw or other similar or suitable contrivance; the whole being constructed and operating substantially as herein above explained and exhibited in the accompanying drawings.

Improvement in the mode of connecting the Rods of Lightning Conductors, &c. By Justin E. Strong, Boston, Mass. April 19th.

Claim.—I shall claim the mode herein before set forth, of connecting the joints of lightning conductors, and constructing and applying the discharging points thereto, that is to say, by forming each point with a shoulder and a shank in rear of the same, the said shank having a screw cut on the same, and passing through one of the rods, and being screwed into the other; the whole being arranged and applied to a building substantially as described.

Improvement in Smut Machines. By William B. Palmer, Rochester, N. Y. April 19th.

Claim.—I disclaim the original invention of the smut machine; and what I claim as my invention, and desire to secure by letters patent, are the following improvements, viz: The combination of the fan with the cones in the manner set forth, the internal cone being perforated and constructed with a fluted head, and having the fan arranged and moved within it, as described; also the combination of these, so constructed and arranged, with the external cone, as described.

Improvement in Machines or Screens for Sifting Coal, Grain, &c. By Elisha D. Payne and Enos Woodruff, Newark, N. J. April 19.

Claim.—What we claim, and for which we ask letters patent, is, combining the inclined guide-board with a box or case for receiving the material to be sifted, constructed as described, said box consisting of side and end pieces, and an inclined bottom pierced with apertures for sifting the coal or other materials, the whole being arranged as herein set forth. Also, in combination with the sifting box thus constructed, an exterior case for containing the same. Lastly, in combination with the sifter box and external case, the method of suspending and operating

the sieve by means of the axle *e*, the spring *d*, and the wheel *c*, the whole being constructed and operating in the manner herein set forth.

Improvement in Seal Presses. By A. RALSTON CHASE, Cincinnati, Ohio. April 19th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the combination of the lever F, having an eccentric formed on its end at E, (F′) with the guide-rod D, and the spiral or coiled spring J, the whole being constructed and operating as set forth.

Improvement in the iron Liquor employed by Dyers as a Mordant for dyeing Black. By JOHN D. PRINCE, Lowell, Mass. April 24th.

CLAIM.—Having thus fully described the nature of my invention, what I claim therein, and desire to secure by letters patent, is the combining of arsenious acid with sulphate of iron, in the manner and for the purpose herein fully made known; and this I claim, whether the two substances are mixed in a dry state, and afterwards dissolved, or whether the two substances be separately dissolved and afterwards mixed together; nor do I intend to limit myself to the proportional quantities of the two substances herein stated as being generally used, but intend to vary these proportions within any limits which I may find to be advantageous.

Improvement in the Spring Lancet. By JOHN M. VAN OSDEL, Chicago, Ill. April 24th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the giving a reäcting motion to the blade of a spring lancet, by the combination of the spiral spring, and the compound cranks or bridle pieces *ee*, as herein set forth; also, I claim the method of setting the lance by simply drawing back the rod *f*, as herein set forth.

Improvement in the manner of manufacturing Boots and Shoes, by substituting a Metallic Shank for that portion of the Out Sole which answers to the Hollow of the Instep and Heel. By ANSEL THAYER, Braintree, Mass. April 24th.

CLAIM.—What I claim as constituting my invention, and desire to secure by letters patent, is the employment of a metallic shank extending along the instep and heel of boots and shoes, in place of the out sole of leather, said shank being formed and affixed substantially in the manner herein set forth.

Improvement in apparatus to be attached to Chimneys to increase the Draft, and prevent their Smoking. By JOSEPH HURD, Jr. Stoneham, Mass. April 24th.

CLAIM.—Having thus described my invention, I shall claim, discharging the smoke from a chimney, or the impure air of an apartment from the same, by a discharging wheel constructed and revolved as above described, and also by means of a cowl having a horizontal shaft passing through it, upon the front end of which a wind wheel is affixed,

and upon the rear end and over the mouth of the cowl a discharging wheel, to be set in motion by the action of the wind on the former; the proper position of said cowl, with respect to the wind being regulated by a vane suitably attached to, and which turns the same; the whole being arranged and operating substantially as herein before set forth.

Improvement in the construction of iron Truss Bridges. By SQUIRE WHIPPLE, Utica, N. Y. April 24th.

CLAIM.—Now, what I claim as my invention in the above described improvement, and desire to secure by letters patent, is the method of sustaining the flooring of bridges by iron trusses, containing cast-iron arches formed in sections or segments, in combination with diagonal ties or braces, to sustain the form of the arch against the effects of unequal pressure, (with or without vertical posts or rods) and wrought-iron arch strings or thrust ties to sustain the thrust and prevent the spreading of the arch, in case the abutments and piers be not relied on for that purpose. Also, the divergence or horizontal expansion of the arch from the middle portion to the ends thereof, in wooden trusses or arches as well as in those composed of iron.

Improvement in the Fastener for Window Blinds and Shutters. By JAMES P. McKEAN, Washington, D. C. April 24th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the combination of the bolt D, working through the lower rail of the shutter near one edge, with the bar or lever B, having a handle (passing through the inside of the shutter) near the other edge, for the purpose and in the manner specified.

Improvement in Smut Machines. By JAMES COPPUCK, Mount Holly, N. J. April 24th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the method of constructing the cylinder or truncated cone with flutes, as described, in combination with the revolving fan or wings acting as beaters, and to produce a current of air through the machine; the whole being constructed and operating substantially in the manner set forth.

Improvement in Machinery for Cleaning and Winnowing Grain. By ZALMUN RICE, Lyons, N. Y. April 24th.

CLAIM.—What I claim therein as new, and desire to secure by letters patent, is the manner of employing a second fan wheel, operating in a direction the reverse of that usually employed, so as that the current of wind from it shall be directed downwards, in the manner, and for the purpose set forth. I also claim the using of the device which I have denominated a conductor, on the lower side of the upper screen, and attached to the frame thereof; and also, if preferred, on the lower sides of the frames of the sieves or screens, used for sifting or screening the grain in such a machine as herein described and made known; said conductors being so placed as to adapt them to the carrying of the

grain or other matters either backwards or forwards, according to the direction required by the inclination given to such screens or sieves.

Improvement in the Gin for Ginning Cotton. By C. A. McPhetridge, Natchez, Miss. April 24th.

Claim.—What I claim as my invention, and which I wish to secure by letters patent, is the peculiar arrangement of the roller, having grooves into which the saws work, in combination with the saws, for the purpose and in the manner specified and set forth.

Improvement in Cooking Stoves. By Hiram Blanchard, Aquackanock, N. J. April 27th.

Claim.—What I claim as my invention, and which I desire to secure by letters patent, is :—

1. Constructing the guard-plate G with a cross-piece, to form a bottom for the air-chamber, in combination with the vertical shield or combination of the guard-plate extended below said cross-piece, for the purpose of preventing coals &c. passing into the flue under the oven, the whole being constructed as above described.

2. Constructing the front of the stove with an inclination forward and above the hearth of said stove, in combination with the apertures governed by a register, as set forth, for the purpose of receiving the smoke &c. when articles are cooked on the front hearth, or ashes when the fire is raked, as before described.

Improvement in the method of constructing and combining the Piston Rods of Steam-Engines, to enable any length of Crank to be used, which I denominate the Compound Piston Rod. By John R. St. John, Cleveland, Ohio. April 27th.

Claim.—What I claim as my invention and desire to secure by letters patent, is the combination of two or more "compound piston-rods," working in appropriate cylinders, as set forth, with an equal number of cranks arranged on the shaft, to which the power is communicated, the whole being combined, constructed and operating substantially in the manner and for the purposes described. The said "compound piston rod" being my own invention, but not claimed for reason of being effective only in a combination of two or more, as herein claimed and set forth.

Improvement in the manner of constructing Railroad Carriages so as to ease the Lateral Motion of the Bodies thereof. By Albert Bridges and Charles Davenport, Cambridgeport, Mass. May 4th.

Claim.—We shall claim, supporting the carriage or body of the same upon or connecting it to the wheel-frame, by means of thorough braces, or pendulous bars or links, either suspended or not, at pleasure, to springs on the wheel-frame, and arranged according to the modes above represented, (all of which modes permit a lateral motion of the running machinery, independent of the body of the carriage) in combination with the side springs, opposed to said lateral motion, and which

are disposed and operate substantially in the various ways described; the whole being for the purpose of preventing the injurious and unpleasant effects resulting to the car and passengers or goods therein, from the sideway movements of the flanches of the wheels against the rails of the track, as herein before set forth.

Improvement in the construction of Cheese Presses. By DAMON A. CHURCH, Friendship, N. Y. May 4th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the manner in which I have arranged and combined the respective parts thereof so as to accomplish the desired end; that is to say, the manner in which I have combined the double ratchet wheel with the shaft F, the wheels N N, and the cords winding round said shaft and passing over the pulleys *aa*, in the movable pieces *cc*; by which combination and arrangement the weight E, which is attached and suspended in the manner described, produces a progressive and continuous pressure upon the cheese or other article to be pressed.

It will be manifest that considerable difference may be made in constructing this machine without departing from the general principle or mode of action upon which it is dependent. I do not intend, therefore, to limit myself in this particular, but to vary said machine as I may think proper, while I produce the same effect by means substantially the same.

LIST OF ENGLISH PATENTS

GRANTED BETWEEN THE 29TH OF MARCH AND THE 27TH OF APRIL, 1841.

James Tildesley, of Willenhall, Stafford, factor, and Joseph Sanders, of Wolverhampton, lock manufacturer, for improvements in locks. March 29; six months to specify.

George Evans, of Dorset-place, Marylebone, for an improvement or improvements upon trusses for the relief of hernia. March 29; six months.

Alexander Parkes, of Birmingham, artist, for certain improvements in the production of works of art in metals by electric deposition. March 29; six months.

John Lindsay, of Lewisham, esquire, for improvements in covers for water closets, night stools, and bed pans. March 29; six months.

James Furnival, of Warrington, currier, for an expeditious mode of unhairing, mastering, and tanning various descriptions of hides and skins. March 29; four months.

Thomas Gore, of Manchester, machine maker, for certain improvements in machinery or apparatus for roving, spinning and doubling cotton, silk, wool and other fibrous materials. March 30; six months.

John Oram, of Chard, Somerset, machinist, for improved machinery or apparatus for making or manufacturing netted fabrics. March 31; six months.

William Jenkinson, of Salford, machine maker, for certain improvements in machinery for preparing and spinning flax, silk, and other fibrous substances. March 31; six months.

Joseph Gaury, of Watling-street, warehouseman, for a parachute to preserve all sorts of carriages using axletrees from falling, or injury upon the breaking of their axletrees. (A communication.) March 31; six months.

John George Bodmer, of Manchester, engineer, for certain improvements in the construction of screwing stocks, taps, and dies, and certain other tools or apparatus or machinery for cutting and working in metals. April 3; six months.

James Ogden, of Manchester, cotton spinner, and Joseph Grundy Woollam, of

Manchester aforesaid, commission agent, for certain improvements in looms for weaving. April 3; six months.

William Edward Newton, of Chancery-lane, civil engineer, for certain improvements in the process, mode or method of making or manufacturing lime, cement, artificial stone, and such other compositions, more particularly applicable for working under water, and in constructing buildings and other works which are exposed to damp. (A communication.) April 3; six months.

Zacharia Bryant, of Nottingham, machinist, for an improved method of manufacturing cloth and other fabrics from woolen, cotton, flax, silk, and other substances. April 3; six months.

James Anderson, of Newcastle-upon-Tyne, engineer, for improvements in windlasses. April 5; six months.

William James Barsham, of Bow, gentleman, for improvements in fastening buttons and other articles on to wearing apparel and other descriptions of goods or manufactures. April 5; six months.

Henry McEvoy, of Graham-street, Birmingham, hook-and-eye maker, for improvements in fastenings for bands, straps, and parts of wearing apparel. April 5; six months.

Jonathan Beilby, of York, brewer, for improvements in brewing. April 5; six months.

William Hutchinson, of Sutton-on-Trent, Nottingham, seed-crusher and oil-cake manufacturer, for certain improvements in the manufacture of oil cake or seed cake. April 5; six months.

William Littell Tizard, of Birmingham, brewer, for certain improvements in apparatus for brewing. April 5; six months.

Joseph Wilson Nuttall, of Belper, draper, and Henry Holden, of the same place, tailor, for improved apparatus to be attached to trowsers, commonly called trowsers straps. April 5; six months.

Joseph Apsey, of Cornwall-road, Lambeth, engineer, for improvements in the construction of flues for steam boilers and other furnaces. April 6; six months.

Christopher Edward Dampier, of Ware, gentleman, for improvements in weighing machines. April 15; six months.

Frank Hills and George Hills, of Deptford, manufacturing chemists, for certain improvements in the manufacture of sulphuric acid and carbonate of soda. April 15; six months.

Henry Augustus Wells, of St. John's Wood, gentleman, for certain improvements in the manufacture of woolen cloths. April 17; six months.

Peter Kendall, of Gifford's Hall, Suffolk, esquire, for an improved method or methods of connecting and disconnecting locomotive engines and railway carriages. April 17; six months.

Joseph Barker, of Regent-street, Lambeth, artist, for improvements in measuring aëriform or fluid substances. April 20; six months.

Joseph Bentham, of Bradford, weaver, for improvements in weaving. April 22; six months.

Henry Brown, of Codnor-park iron works, Derby, iron manufacturur, for improvements in the manufacture of steel. April 22; six months.

Thomas Harris, of Hales Owen, Birmingham, horn-button manufacturer, for improvements in the manufacture of what are called horn buttons, and in the dies to be used in the making of such descriptions of buttons. (Partly a communication.) April 22; six months.

Humphrey Jefferies, of Birmingham, button maker, for improvements in the manufacture of buttons. April 22; six months.

John Rostron, of Edenfield, Lancaster, manufacturer, and Thomas Welch, of Manchester, manufacturer, for certain improvements in looms for weaving. April 22; six months.

Floride Heindrychx, of Fenchurch-street, engineer, for certain improvements in the construction and arrangement of fire-places and furnaces, applicable to various useful purposes. April 24; six months.

Lancelot Powell, of Clydach Work, Brecon, ironmaster, and Robert Ellis, of Clydach, aforesaid, agent, for certain improvements in the manufacturer of iron. April 24; six months.

Thomas Robinson, of Wilmington-square, for improvements in drying wool, cotton and other fibrous materials in the manufactured and unmanufactured state. April 27; six months.

William Petrie, of Croydon, Surrey, gentleman, for a new mode of obtaining a motive power by voltaic electricity applicable to engines and other cases where a motive power is required. April 27; six months.

Alexander Southwood Stocker and Clement Heeley, both of Birmingham, manufacturers, for certain improvements in pattern and clog ties, and other articles of fastenings of dress. April 27; six months.

Benjamin Rankin, of College-street, Islington, gentleman, for a new form and combination of and mode of manufacturing blocks for pavement. April 27; six months.

Osborne Reynolds, of Belfast, Ireland, clerk, for improvements in paving streets, roads and ways. April 27; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND FROM THE 22D OF MARCH TO THE 22D OF APRIL, 1841.

Joseph Stubbs, of Warrington, Lancaster, file manufacturer, for certain improvements in the construction of screw wrenches and spanners, for screwing and unscrewing nuts and bolts. Sealed March 26. (A communication from abroad.)

George Henry Fourdrinier and Edward Newman Fourdrinier, both of Hanley, Stafford, paper makers, for certain improvements in steam-engines for actuating machinery, and in apparatus for propelling ships and other vessels on water. March 31. (Being a communication from abroad.)

William M. Kinley, of Manchester, engraver, for certain improvements in machinery or apparatus for measuring, folding, plaiting or lapping goods or fabrics. March 31.

Charles Green, of Birmingham, Warwick, gold plater, for improvements in the manufacture of brass and copper tubes. April 1.

Henry Newson Brewer, of Jamaica Row, Bermondsey, Surrey, mast and block maker, for an improvement or improvements in wooden blocks for ships, rigging, tackles, and other purposes where pulleys are used. April 7.

John Barber, of Manchester, Lancaster, engraver, for certain improvements in machinery for the purpose of tracing or etching designs or patterns on cylindrical surfaces. April 8.

George Blaseland, of Greenwich, Kent, engineer, for an improved mode of propelling ships and vessels at sea and in navigable waters. April 8.

James Pilbrow, of Tottenham, Middlesex, engineer, for certain improvements in steam-engines. April 8.

Robert Pettit, of Woodhouse Place, Stepney Green, Middlesex, gentleman, for improvements in railroads, and in the engine carriages and wheels employed thereon. April 12.

William Samuel Henson, of Allen-street, Lambeth, Surrey, engineer, for certain improvements in steam-engines. April 14.

Henry Bessemer, of Percival-street, Clerkenwell, Middlesex, engineer, for a new mode of checking the speed of or stopping railroad carriages under certain circumstances. April 20.

Hugh Graham, of Bridport Place, Hoxton New Town, Middlesex, artisan, for an improved manufacture of that kind of carpeting usually denominated "Kidderminster carpeting." April 21.

LIST OF IRISH PATENTS GRANTED FOR MARCH, 1841.

John Clay, for improvements in arranging and setting up types for printing.

Robert Cooper, for improvements in ploughs.

Peter Bradshaw, for improvements in dibbling and drilling corn, seed, plants, roots, and manure.

Charles Payne, for improvements in salting animal matters.

James Molyneux, for an improved mode of dressing flax and tow.

James Davis, for improvements in the manufacture of soap.

Fredrick Steiner, for improvements in looms for weaving and cutting asunder double (piled) cloths, and a machine for winding weft for use therein.

John Whertheimer, for certain improvements in preserving animal and vegetable substances and liquids.

W. R. Westly, for certain improvements in carding, combing, straightening, cleaning, and preparing for spinning, hemp, flax, and other fibrous substances.

William W. Murray, for certain improvements in machinery used in the manufacture of paper.

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